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SCIENCE
VERSUS
IDEALISM

Science Versus Idealism

An Examination of "Pure Empiricism" and Modern Logic

By

MAURICE CORNFORTH

M.A.

To the Memory of David Guest

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M. C. CORNFORTH.

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INTRODUCTION

THIS book examines a particular trend in modern philosophy—the trend of " empiricism " or more precisely of " pure empiricism." I have tried to trace the process of the development of such theories, to show where they go wrong, and to suggest the right way of dealing with the questions at issue.

More specifically, the purpose of this book is to examine and to criticise that tendency of modern philosophical thought which, taking its origin in the materialism of Bacon and his successors, Hobbes and Locke, turned from materialism to subjective idealism, gave rise to the various subjectivist theories of Berkeley, Hume, Mach and the agnostics, and is still alive today, giving rise to fresh philosophical theories in the same tradition.

In the first part of this book I have surveyed the main line of development from Bacon to Mach.

This same line of development—though in some respects it seems to have ceased to develop and to have reached a complete theoretical dead-end—has been continued in the present century with the theories known as " Logical Analysis " and " Logical Positivism."

The peculiar and " new " characteristic of this philosophy today is that it has now turned to formal logic for its basis and justification. It has developed a system of logic and methods of " logical analysis." This " logical analysis " was first formulated by Bertrand Russell, beginning with his books, *The Principles of Mathematics* and *Principia Mathematica.* Then it was further taken up in Wittgenstein's *Tractatus Logico-Philosophicus.* And its latest form is to be found in the works of the school of Logical Positivists, founded by Rudolf Carnap, who base their views on what is called the study of " logical syntax " and " the logical analysis of science."

The examination of these " logical " schools is unfortunately an involved and difficult process, as compared with the relative simplicity and straightforwardness of the ideas of their predecessors. The second and longest part of this book is devoted to unravelling them.

Today these particular theories pass themselves off as the very last word in scientific enlightenment. But I believe that, far from representing the summit of scientific philosophy, they are rather a barrier standing in the way of the progress of scientific thought. In trying to get to grips with them, it is important not to take them at their face value. They did not appear suddenly out of the blue, as their authors themselves sometimes seem to think, as the long-sought solution of all the problems of philosophy. They have an historical background, and are only descendants of certain earlier tendencies of philosophy. And so I have approached them historically, to find out both where they came from and whither they are leading. (The answer to the first question is that they derive from the idealist theories of George Berkeley. The answer to the second question is—nowhere.)

While the purpose of this book is mainly critical, criticism can have little value unless it is directed from some positive standpoint. In that case, criticism of rival points of view helps to develop and test the validity of the standpoint from which it is directed. My own standpoint is that of philosophical materialism, which in its modern form is known as Dialectical Materialism.

This standpoint contains a very definite criterion whereby one may attempt to judge the value of any philosophy. The value of any philosophy must be judged by how far it helps to understand and to solve the practical problems facing humanity. This is a test, not merely of its social utility, but of its truth.

I would say that the outstanding problem of life today arises from the contrast between the enormous new powers of production at the disposal of society and our apparent lack of ability to control them. This in turn reflects the basic contradiction between the growing power of social production and the social organisation which places it at the disposal of a small privileged class as their private property. It is this which impedes productive development, and even leads to productive powers being used to destroy nations in warfare, instead of for lightening the labour and increasing the material prosperity of mankind.

Now the development of the means of production, and the

discovery and use of new sources of productive power, has depended on the advance of the natural sciences, of scientific knowledge. The growth of science, extending to all spheres of phenomena, and building up more and more a unified scientific picture of the world we live in, has been the outstanding theoretical fact of the present age.

Philosophy, therefore, has today above all the task of enabling us to understand the significance of science, and its meaning for us ; and to understand the nature of the tasks which face us in harnessing this knowledge, and the power it confers, for the purposes of human progress.

In this sense, philosophy must be a matter of deep concern, not merely to " professional philosophers," but to every thinking man and woman. And we find, too, that the whole of modern philosophy, and of contemporary philosophy in particular, tends to become more and more engrossed with questions of the significance and interpretation of the sciences. Thus modern " logical analysis " becomes above all " the analysis of science."

But contrary tendencies exist in the sphere of philosophical ideas. There are philosophical tendencies which are helping forward the advance of science, and are helping us to understand it and its significance in the modern world ; and there are contrary tendencies. The former are serving the interests of the forces of progress—that is, the forces working for the fullest development of our productive powers for the welfare of mankind ; and the latter are not. Clearly, therefore, the positive work of pressing forward philosophical truth must be combined with the negative task of criticism and controversy. Indeed, progress and truth in any sphere is only won in the midst of the struggle against reaction and error.

It is my contention that philosophical progress is in the main represented by the development of materialist ideas and by the contradictions and controversies between materialist and idealist theories.

Such a fundamental division of philosophy into materialist and idealist trends reflects the fact that the development of scientific knowledge comes into conflict at every stage with various traditional supernatural ideas, and in particular with the ideas of religion. The religious explanation of life and of

the world is very deep-rooted, and it arises from a stage prior to the winning of scientific knowledge. As scientific knowledge is won it continually contradicts and oversets the accepted notions of religion.

Materialism is that trend in philosophy which champions scientific knowledge as against supernatural beliefs. On the other hand, idealism is that trend which, in a direct or indirect way, defends supernatural beliefs against scientific truth.

As science extends our knowledge of nature and society, and lays the basis for a new mode of living for humanity, so does idealist philosophy hasten to the rescue of the threatened traditional ideas. And by so doing it serves to obscure the understanding of the significance of science and of the possibilities which the utilisation of science opens up for the people.

The materialist philosopher Frederick Engels gave the following well-known characterisation of the theoretical difference between materialist and idealist trends of philosophy :—

" The great basic question of all philosophy, especially of modern philosophy, is that concerning the relation of thinking and being. . . . The answers which philosophers have given to this question split them into two great camps. Those who assert the primacy of spirit to nature, and, therefore, in the last instance, assume world creation in some form or other, comprise the camp of idealism. The others, who regard nature as primary, belong to the various schools of materialism."[1]

Thus materialist philosophy holds, in one way or another, that all events have a natural explanation. Idealism, on the other hand, postulates ultimate spiritual or supernatural causes.

Materialism, therefore, whether in an open or in a disguised and apologetic form, challenges the whole standpoint of religion. Idealism, on the other hand, though it may not take a theistic form, is an apology and justification for the religious outlook.

Thirdly, while materialist philosophy encourages the outlook that men can learn to control nature by gaining knowledge and understanding of the material world, and thereby can become masters of their own destiny, idealism tends to preach dependence and subjection to the supernatural.

When philosophical inquiry, as distinct from theology based

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[1] Engels. *Feuerbach*. Ch. 2.

on the elaboration of accepted religious notions, first arose in ancient Greece, it took the form of philosophical materialism. It was the attempt of Thales of Miletos to find a natural, though purely speculative, explanation of the whole world, by the theory that everything had evolved through the changes and differentiations of one Primary Substance, that gave the first impulse to the development of philosophical thought.

But very soon the materialist philosophy of Thales and his followers in the ancient world was met by the counter-development of idealist theories (first elaborated in the philosophy of Pythagoras), which taught that the cause of all things was spiritual and that knowledge was to be obtained by the inner light of the soul and not through sense and experience.

The rapid and brilliant development of modern natural science seems definitely to confirm and justify the materialist view of the world. The natural explanation of all things, which such ancient thinkers as Thales or Democritus or Epicurus could establish only speculatively and in very general outline, is being established scientifically and in ever growing detail and comprehensiveness by the advance of natural science during the past three hundred years.

The advance of science, then, and the development of new processes and techniques associated with it, have not only revolutionised methods of social production and created the basis for great social transformations. At the same time modern natural science from its inception has represented a challenge and a threat to all old-established ideas, particularly the ideas of religion, and so laid the basis for a great transformation of ideas. It was inevitable, therefore, that it should give rise to a reaction. This reaction was expressed in new forms of idealist philosophy, whose tendency was to justify religious ideas in the face of the challenge of science.

Thus with the rise of natural science, materialist philosophy had begun, with the philosophy of Bacon, to develop a materialist theory of knowledge, as a justification of science and a contribution to the understanding of scientific methods. It was particularly on the ground of the theory of knowledge that modern idealism made its most effective challenge to materialism. A marked tendency of modern idealism has been to retreat from a position where it would challenge

natural science on its own ground, formulating supernatural as distinct from natural explanations of phenomena. Instead, it has concentrated attention more and more on the theory of knowledge. And its method has been to declare that science is after all not knowledge of the objective material world, but only of the subjective world of ideas; and that therefore, while science may be valid in its own sphere, religion and idealism nevertheless represent the ultimate truth.

This form of idealism was first clearly formulated by George Berkeley, in the year 1710. Its theory of knowledge took the form of empiricism—recognising with science that knowledge could only be reached through the means of the senses and experience, but maintaining that sensation nevertheless cannot give us knowledge of the real external material world.

It was further developed by Hume, in another way by Kant, and then by the neo-Kantians, Machians, positivists and agnostics in the 19th century.

In our own day it is carried on by the schools of "logical analysis" and "logical positivism." In essentials, indeed, these schools are lined up in the camp of philosophical idealism in opposition to philosophical materialism. It will be shown that the principle, first vaguely foreshadowed by Wittgenstein, and then formulated as a rigid methodological dogma by Carnap, that we cannot compare thoughts with things, propositions with facts, but only thoughts with thoughts, propositions with propositions, most decisively ranges these schools within the idealist camp.

It is interesting, too, to note that "logical analysis" began with Russell affirming what is known as "a correspondence theory of truth," that is, that truth consists in the correspondence of propositions with facts, in opposition to the idealists who held that there were no objective facts and that truth consisted simply in the "coherence" of ideas within a total system of ideas. But the development of "logical analysis" finally leads back again to a "coherence theory" of truth. With Carnap, the correspondence of our ideas with facts of any sort vanishes altogether, and we are left with nothing but the system of our ideas.

For materialism, on the other hand, every idea must be tested by comparison with objective reality; and that test is in the last analysis provided by practice.

At the same time it is to be remarked that these theories—essentially lined up with idealism in the struggle against a scientific materialist view of the world and of life—claim to be very revolutionary, ultra-scientific, and Carnap even calls himself " a materialist." They claim to be based on the strictest logic, on the most empirical empiricism. They claim to de-bunk all superstitions. But the principal " superstition " and " metaphysical illusion " that they set out to overthrow, is that of the real existence of the objective material world.

But I believe that in opposition to such theories, and to all the conundrums and confusions produced by idealism, philosophical progress today is represented, and can only be represented, by the progress of materialist theories. And in proof of this may be cited the whole great development of natural science over more than three hundred years, and the ensuing development of philosophical theory through the English materialists of the 17th century, the French materialism of the 18th century, together with the all-embracing dialectical logic of Hegel, to the philosophical standpoint of contemporary dialectical materialism.

In a popular book entitled *The Evolution of Physics*, Einstein and Infeld wrote : " Our intention was to sketch in broad outline the attempts of the human mind to find a connection between the world of ideas and the world of phenomena. We have tried to show the active forces which compel science to invent ideas corresponding to the reality of our world."[1]

I quote this remark as an example of a thoroughly materialistic account, by scientists, of the significance of science. Science establishes " a connection " between ideas and the real world, it " invents ideas corresponding to reality." Therefore on the basis of science we reach an ever-expanding and deepening *knowledge* of the objective world and of our place in it, which banishes all superstitions, ghosts and supernatural forces, and which is a weapon for the liberation of mankind and for the control of both natural and social forces in the interests of humanity.

This is in accord with the further definitions of materialism which Lenin gave, continuing the work of Engels, in his book, *Materialism and Empirio-Criticism* :—

[1] Einstein and Infeld, *The Evolution of Physics*. Preface.

" The fundamental premise of materialism is the recognition of the external world, of the existence of things outside and independent of the mind. . . . The recognition of objective law in nature, and that this law is reflected with approximate fidelity in the mind of man, is materialism. . . . Our consciousness is only an image of the external world, and the latter exists independently. . . . Matter is the objective reality which is given to man by his sensations, and which is reflected by our sensations while existing independently of them."[1]

But anti-materialist philosophy, the same with " modern logic " as with older philosophies, will have none of this materialism. It has the greatest respect for science. But it will not allow that science establishes " a connection " with the objective material world. By no means. It establishes a connection only between ideas. And it will not allow that science " invents ideas corresponding to reality." Science only invents ideas. To talk about objective material reality, about the connection between ideas and the external world, is said to be quite " unscientific " ; it is nothing but " meaningless metaphysics." That was the standpoint of Berkeley over two hundred years ago, and it is the standpoint of Logical Positivism today.

And so what do such anti-materialist theories amount to? They are theories which try to limit the scope and power of our minds. From the standpoint of materialism, we see in science a great weapon of enlightenment and emancipation—increasing our knowledge of the real world and therefore our power to live well in that world, and destroying the superstitions and illusions which fog the mind, debase the dignity of the human race, and uphold oppression, exploitation and backwardness. But these theories try to disarm science. Therefore future progress demands that these theories should be shown up, refuted, discredited.

That is what I have tried to do in this book. And at the same time I have tried to indicate some of the ways in which materialism can tackle problems raised by modern science and by the philosophy of science.

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[1] Lenin, *Materialism and Empirio-Criticism*, Selected Works, Vol. 11, pp. 148, 216, 136 and 192.

PART ONE

MATERIALISM AND EMPIRICISM

4. *What is the Object of Knowledge?*

In proceeding to the further elaboration of his theory, Locke made an assumption which proved to be of the very greatest importance.

Namely, he maintained that when we perceive, think, understand, judge, know, in other words, when we carry out any act of cognition from the simplest sort of sense-perception to the most complicated thought, then the *objects* of our cognition are not external objects themselves, but are rather *our own ideas* which are called up in our minds by the action of external objects.

This assumption is made in his initial definition of the term "idea," which he defined as "that term which, I think, serves best to stand for whatsoever is the *object* of understanding when a man thinks."[1]

In dealing with the development of knowledge, Locke proceeded to say: "Since the mind, in all its thoughts and reasonings, hath no other immediate object but its own ideas, which it alone does or can contemplate, it is evident that our knowledge is only conversant about them. Knowledge, then, seems to me to be nothing but the perception of the connexion and agreement, or disagreement and repugnancy, of any of our ideas. In this alone it consists."[2]

The perceptions, thoughts and knowledge of man, therefore, are confined within the circle of his own ideas. It is ideas, not things, that we "contemplate" or are "conversant about."

But since ideas were originally caused through the action of real external objects, Locke thought that nevertheless knowledge *does* relate to the objective world, in so far as ideas are *copies* of things. "It is evident that mind knows not things immediately, but only by the intervention of the ideas it has of them. Our knowledge therefore is real only so far as there is conformity between our ideas and the reality of things."[3]

But this means that our knowledge of the nature of things is necessarily very limited. Thus because we can be "conversant" only with our ideas of bodies, and not with bodies

[1] Locke: *Essay on the Human Understanding*, I, 1, 8.
[2] Ibid., IV, 1, 1–2.
[3] Ibid., IV, 4, 3.

themselves, " therefore I am apt to doubt, that how far soever human industry may advance useful and experimental philosophy in physical things, scientifical will still be out of our reach ; because we want perfect and adequate ideas of those very bodies which are nearest to us, and most under our command."[1]

In particular, as to what is the *substance* of real things, we must remain for ever ignorant.

Gone is Hobbes' easy assurance that in saying that the universe consisted in bodies, he had expressed the general nature of the universe. According to Locke, when we repeatedly find a group of simple ideas associated together, then " we accustom ourselves to suppose some substratum wherein they do subsist, and from which they do result ; which therefore we call substance."[2] But what the nature of this substance is, our ideas do not inform us. They only indicate to us that substances exist, which are the ultimate cause of our ideas. " If anyone will examine himself concerning his notion of pure substance in general, he will find he has no other idea of it at all, but only a supposition of he knows not what support of such qualities, which are capable of producing simple ideas in us."[3]

" The secret, abstract nature of substance " is necessarily unknown to us. " The idea of corporeal substance or matter is as remote from our conceptions and apprehensions, as that of spiritual substance or spirit."[4]

Thus with Locke a position was reached, which he derived from the original materialist principle that all knowledge is based upon experience, according to which the object of our knowledge is not the objective external material world, but the subjective world of our own ideas.

The scope of our knowledge is limited to the perception of the order and arrangement, agreement and disagreement, of our own ideas. Behind our ideas, so to speak, and causing them, is the real material objective external world. But of the nature of the objects that constitute this world, we can

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[1] Locke : *Essay on the Human Understanding*, IV, 3, 26.
[2] Ibid., II, 23, 1.
[3] Ibid., II, 23, 2.
[4] Ibid., II, 23, 5.

know nothing. They are, to use a phrase coined a hundred years after Locke, unknowable " things in themselves."

At the same time, and certainly inconsistently, Locke maintained that, to a certain extent, our ideas are true copies of real things, and to that extent we do know what " things in themselves " are like ; namely, our ideas of solidity, extension, figure, motion and number are true representations of the real solidity, extension, figure, motion and number of objective things.

(Incidentally, it is interesting to note that Locke used his doctrine of the unknowability of substance—a thesis which has often since his time been used as a basis for all manner of idealism and mysticism—as an argument in favour of a materialist view of the world. In one passage he argued against the dogma that " spiritual substance " must have an existence independent of matter, by saying that, since we do not in any case know what the real nature of matter is, therefore it is perfectly possible " that matter thinks.")[1]

5. *A Parting of the Ways*

With Locke, English materialism reached a parting of the ways.

On the one hand, his insistence that the object of knowledge is the world of our own ideas, and that the substance of objective things is unknowable, led away from materialism, to subjective idealism and agnosticism.

On the other hand, his insistence that all knowledge is the product of sense-experience ; that sensation is caused by the action of external objects on the bodily sense organs ; that our ideas, at least of primary qualities, are copies of real things ; led to the further development of materialism. And this further development was principally undertaken by the great French materialists of the 18th century, whose heritage was in turn studied and developed in the 19th century by Marx and Engels.

Locke's doctrine of ideas was in fact inconsistent, and so led to contradictory results according to which side of his inconsistency was stressed, and which side was criticised.

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[1] Locke: *Essay on the Human Understanding*, IV, 3, 6.

On the one hand, he could be criticised in that, having said that knowledge was limited to the world of our own ideas, he nevertheless allowed ideas to be represented as the product of the action of external objects, and to be copies of such objects. For if only our own ideas are the objects of our knowledge, how can we possibly know whence those ideas arise, or what they are copies of?

On the other hand, he could be criticised in that, having said that our ideas are the products of the action of external objects and are copies of such objects, he nevertheless maintained that knowledge is limited to the relations between ideas, and that the substance of objective things is unknowable.

How did Locke's theory come to involve such inconsistencies, leading to such contradictory lines of criticism, and contradictory tendencies of future development arising—which were certainly not apparent in the work of his materialist predecessors, Bacon and Hobbes?

As has been shown, Locke was the man who first tried to develop in detail the fundamental materialist theory of knowledge of Bacon and Hobbes; and it was in the manner of this detail development that the inconsistencies arose.

In working out this detail theory, Locke made certain rigid and hard and fast distinctions. In particular :—

(1) He rigidly distinguished the sensation or idea produced in the mind, from the external object on the one hand, and from the act of cognition on the other hand; so that for him "ideas" seemed to exist as a set of sensible or mental *objects* standing between the knowing mind and the external material world.

(2) He rigidly distinguished the substance of a thing from the totality of its properties, so that while the properties might be known, the substance remained as some unknown "support" of such properties. The substance or being was abstracted from the thing's life-history, and set up as a separate unknowable existence distinct from the totality of happenings, relationships and properties.

(3) He rigidly distinguished theory from practice, knowing from doing, so that it appeared that while a man might in his practical life be busily engaged with material things, in his theoretical activity he was not engaged with material things at all, but with his own ideas.

It was from such rigid distinctions and abstractions, that the difficulties and inconsistencies arose.

The setting up in thought of such hard and fast antitheses which do not exist in fact is what, since the time of Hegel, has come to be called the " metaphysical " mode of thought. Locke inherited this habit of thought from the whole previous development of both philosophy and science. And where it led him in the development of English materialism shows that the whole subsequent forward development of materialism has to be along the lines of overcoming such narrow metaphysics. It was Marx and Engels who subsequently succeeded in finally freeing materialism from metaphysics.

CHAPTER 2

MATERIALISM AND THE RISE OF CAPITALISM—SCIENCE, PHILOSOPHY AND RELIGION

1. *Social Roots of 17th Century Materialism.—Materialism as the Vindication of Science*

THIS materialist movement of philosophy did not arise and flourish on British soil through any accident. On the contrary, it was the early rise of capitalism in Britain, and the break-up of every form of feudal institution and ideology through the irresistible growth of capitalist relationships within the old system, that provided the soil for this materialist philosophy.

This philosophy absolutely smashed the old scholastic forms of thought, which had to be overcome if the spirit of science, invention and discovery, so necessary for the development of capital, was to hold sway. It smashed the world-outlook of feudal rulers and monks, in order to establish the world-outlook of the owners of capital and of scientists.

It was directly out of the development of natural science that the English materialism of the 17th century arose. Essentially it was a product of the growth of natural science.

Its function was to justify the methods of natural science, which it did by showing how all knowledge must arise from experience and be tested by experience, and how on this basis a systematic and verifiable account of the nature of things, including the human mind, could be reached.

Thus this philosophy did not present any comprehensive cosmological theory, as was the manner of ancient philosophies and also of the contemporary Cartesian theories on the Continent—but it confined itself *mainly* to the elaboration of a theory of knowledge.

The rise of natural science was one of the outstanding features of the period of the break-up of feudalism and the establishment of the foundations of the future capitalist order. It was called forth and conditioned by such factors as the development of navigation, the development of mining, and

Moreover, in the first period of the development of modern natural science, science served as an ideological weapon in the struggle to overthrow the old feudal order of society, that is, to destroy the ideas which helped to bolster up that old order and to establish the programme and beliefs of a new society. But now science is to adopt a non-partisan standpoint. It is to busy itself in formulating useful rules and laws governing the probable sequence and combination of events, which will aid the development of mechanical inventions and discoveries, but it is not to challenge the established ideas or formulate any programme for a radical transformation of human life.

The disarming of science in the struggle for enlightenment and progress, the disarming of science in the struggle against superstition, oppression and exploitation—such, therefore, is the meaning of the reconciliation of science and religion effected by pure empiricism.

CHAPTER 5

THE AGNOSTICS, KANT, AND MACH

1. *Agnosticism*

BERKELEY and Hume may be said to have given to the world the classical form of bourgeois " scientific " philosophy.

But this expression perhaps needs some explanation. By calling their philosophy a " scientific " philosophy, I mean that it was apparently founded on and tested by empirical principles, unmixed with a-priori speculations ; clear, logical, consistent ; and that it clearly recognised the value of natural science as the way to the understanding and interpretation of nature. By calling it a " bourgeois scientific " philosophy, I mean that it harmonised perfectly with the mood and intellectual requirements of the cultured members of the middle class, was progressive and scientific strictly within limits, suggested no revolutionary ideas, left alone the foundations of Church and State, and in general was in no way dangerous to the established and developing capitalist order of society. And by calling it " the classical form " of bourgeois scientific philosophy, I mean that it served as the type and model for all subsequent bourgeois scientific philosophy.

With this achievement, the great movement of British philosophical thought of the 17th and 18th centuries came to an end. In the 19th century all that occurred of any philosophic importance in Britain was the elaboration of the work of Berkeley and Hume—an elaboration often for the worse rather than for the better, the main advances achieved being in the specialised sphere of Logic.

" About the middle of this century " wrote Engels, " what struck every cultivated foreigner who set up his residence in England, was, what he was then bound to consider the religious bigotry and stupidity of the English respectable middle class. . . . But England has been ' civilised ' since then. . . . Anyhow, the introduction and spread of salad oil (before 1851 known only to the aristocracy) has been accompanied by a fatal spread

of continental scepticism in matters religious, and it has come to this, that agnosticism, though not yet considered ' the thing ' quite as much as the Church of England, is yet very nearly on a par, so far as respectability goes with Baptism, and decidedly ranks above the Salvation Army."[1]

In other words, during the course of the 19th century, the ideas of Hume made their way in England, and took the popular form of " agnosticism."

Engels went on to give a well-known characterisation of agnosticism :—

" What, indeed, is agnosticism but, to use an expressive Lancashire term, ' shamefaced ' materialism ? The agnostic's conception of nature is materialist throughout. The entire natural world is governed by law, and absolutely excludes the intervention of action from without. But, he adds, we have no means of ascertaining or of disproving the existence of some Supreme Being beyond the known universe. . . .

" Again, our agnostic admits that all our knowledge is based on the information imparted to us by our senses. But, he adds, how do we know that our senses give us correct representations of the objects we perceive through them ? And he proceeds to inform us that, whenever he speaks of objects or their qualities, he does in reality not mean these objects and qualities, of which he cannot know anything for certain, but merely the impressions which they have produced on his senses."[2]

It would be very wearisome and unnecessary to particularise about the different brands of empirical agnostic philosophy in England in the 19th century—Mill, Huxley, Pearson and the rest. All alike had this in common, that they tried to assimilate the great scientific advances of the 19th century, while maintaining the standpoint that scientific knowledge extends no further than the limits of one's own sense-impressions.

In contrast to Hume, all these later agnostics were extremely muddled.

For Hume boldly and with clarity drew the consequences of pure empiricism, which the agnostics embraced, namely, solipsism of the present moment, denial of causality and

[1] Engels : *Socialism, Utopian and Scientific*, Introduction.
[2] Ibid.

objective causal connection in nature. But on the other hand, the 19th century agnostics tried *both* to assert the limitation of scientific knowledge to sense-impressions, *and* at the same time to affirm that consciousness has a material origin, that man evolved from the animals, and that the universe itself, prior to any mind or consciousness coming into existence, had its beginning in some primordial nebula.

This was no doubt a very scientific philosophy. But they never noticed that if science establishes such propositions as these, and if these propositions are going to be accepted as philosophical truths about the world, then both science and philosophy are certainly venturing far beyond the bounds of any individual's sense-impressions.

Hence the philosophy of the agnostics was indeed of a muddled, half-hearted, inconsistent kind—" shamefaced," as Engels expressed it.

Since Hume, incidentally, the main empirical philosopher who has *consistently* drawn the consequences of pure empiricism, is L. Wittgenstein. " What solipsism means is quite correct," Wittgenstein affirms. And again, of scientific theories : " The Darwinian theory has no more to do with philosophy than has any other hypothesis of natural science." With Wittgenstein, moreover, the role of pure empiricism as a means of smuggling religion past science is also very clearly expressed. It is an " illusion," says he, " that the so-called laws of nature are the *explanations* of natural phenomena." And he goes on to say : " The *feeling* of the world as a limited whole " (i.e., the limitation of knowledge to the circle of my own immediate experience, the limitation of " the world " to " my world ") " is the mystical feeling." " There is indeed the inexpressible ; this shows itself ; it is the mystical."[1]

But between the thorough-going sceptical empiricism of Hume, and the (as we may express it) mystical empiricism of our contemporary, Wittgenstein, went the half-hearted empiricism of the " shame-faced " agnostics—people who at one and the same time took science at its face value as giving a materialist picture of the objective world, and also denied the objectivity of scientific knowledge.

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[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 5.62, 4.1122, 6.371, 6.45, 6.522.

PART TWO

LOGICAL ANALYSIS, LOGICAL POSITIVISM

CHAPTER 7

LOGICAL ANALYSIS AS A PHILOSOPHICAL METHOD

1. *A Galilean Advance; Unassailable and Definitive Truth*

I HAVE examined the empiricism of the past, and now approach its offspring, the empiricism of the present day.

This contemporary "scientific" philosophy—"logical analysis," "logical positivism," "radical physicalism"—puts forward the greatest possible intellectual claims. Its various exponents are indifferent to the history of philosophy. They claim to be the exponents of the only correct and moreover radically *new* method of philosophical thinking, in the light of which most previous philosophy turns out to be meaningless "metaphysics," and all philosophical problems are capable of solution.

Thus Bertrand Russell, who was the principal founder of the views I am now to examine, wrote of his own philosophy: "It represents, I believe, the same kind of advance as was introduced into physics by Galileo; the substitution of piecemeal, detailed and verifiable results for large untested generalities, recommended only by a certain appeal to the imagination."[1]

Russell's pupil, Wittgenstein, went even further:

"How far my efforts agree with those of other philosophers I will not decide," he wrote. But "the *truth* of the thoughts communicated here seems to me unassailable and definitive. I am therefore of the opinion that the problems have in essentials been finally solved."[2]

I propose, however, to examine these various Galilean discoveries, and unassailable and definitive truths, on their merits.

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[1] Russell: *Our Knowledge of the External World*, p. 4.

[2] Wittgenstein: *Tractatus Logico-Philosophicus*, Preface.

2. *Logic as the Essence of Philosophy*

The central feature of the contemporary " scientific " philosophy is the principle, first enunciated by Russell, that " logic " is " the essence of philosophy."

It is useful to recollect that Russell put forward this " logical " conception of philosophy in the rather curious conditions of British philosophical thought at the beginning of the present century. These conditions arose from the fact that, whereas during most of the last century the main philosophic trend in Britain had been a form of agnosticism, towards the end of the century British academic circles suddenly became aware of the existence of Kant and Hegel. Previous to this certain literary " transcendentalists," such as Coleridge and Carlyle, had spoken darkly of the profundities of German " transcendental " philosophy ; but it was not for years after Kant and Hegel were dead that their writings broke through the insular prejudices of our official Victorian philosophers.

Then J. Hutchinson Stirling wrote a book on *The Secret of Hegel*, and Edward Caird and others unravelled Kant for English-speaking readers. Long after the great tide of classical German idealism had subsided, a kind of backwash reached these islands. The flotsam and jetsam of systems of " absolute idealism " were washed up in the British universities.

The philosophical writings of Russell and his associates (particularly G. E. Moore) first appeared as the protest of science and commonsense against these belated disciples of German idealism. This fact contributed greatly to the Galilean appearance of Russell's work ; for he seemed indeed a genuine champion of the scientific outlook, in comparison with his " absolute idealist " contemporaries.

Distinguishing his own philosophical outlook from that of what he called " the classical tradition " in philosophy, Russell found the essence of this tradition in the belief " that a-priori reasoning could reveal otherwise undiscoverable secrets about the universe, and could prove reality to be quite different from what, to direct observation, it appears to be. It is this belief," he added, " rather than any particular tenets resulting from it, that I regard as the distinguishing characteristic of the

classical tradition, and as hitherto the main obstacle to a scientific attitude in philosophy."[1]

In opposition to this tradition, Russell held that philosophy does not and cannot establish or discover new facts, or new generalisations, about the world, or about particular things in the world. That is the task of science, and can only be done on the basis of empirical evidence and scientific method.

Therefore the problems of philosophy, and the philosophical propositions in which these problems are stated and answered, must be of another kind altogether to the problems and propositions of science.

" The consideration that philosophy, if there is such a study, must consist of propositions which could not occur in the other sciences, is one which has very far-reaching consequences," said Russell. He went on to illustrate this : " All the questions which have what is called a human interest—such, for example, as the question of a future life—belong, at least in theory, to special sciences, and are capable, at least in theory, of being decided by empirical evidence. . . . A genuinely scientific philosophy cannot hope to appeal to any except those who have the wish to understand, to escape from intellectual bewilderment. . . . It does not offer, or attempt to offer, a solution of the problem of human destiny, or of the destiny of the universe."[2]

Thus, incidentally, this conception of philosophy at any rate offers us an " escape " from any " intellectual bewilderment " arising from the grave " problem of human destiny," by offering us a means of " escape " from the problem of human destiny itself. But to proceed :—

From this follows the conclusion that philosophical problems " all reduce themselves, in so far as they are genuinely philosophical " (that is, not pseudo-problems, or problems which should be answered through empirical scientific investigation) " to problems of logic. This is not due to any accident, but to the fact that every philosophical problem, when it is subjected to the necessary analysis and purification, is found either to be not really philosophical at all, or else to be, in the sense in which we are using the word, logical."[3]

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[1] Russell : *On Knowledge of the External World*, p. 5.
[2] Ibid., p. 17.
[3] Ibid., p. 33.

Now it will hardly be disputed that many of the expressions which we normally utter or write, even in scientific discussions, are in the logical sense unclear. For instance, it may quite reasonably be asked, What *is* the State? But the question that arises is: *How* is greater clarity to be reached? *How* is "ultimate," or at all events more ultimate, knowledge to be arrived at?

The way to answer this question is, I think, in essentials, not very difficult. If we want more ultimate knowledge about a thing than what we already possess, the way to gain such more ultimate knowledge is to undertake scientific investigation.

Take, for instance, the kind of questions which Mr. Wisdom thought should be answered by philosophical analysis.

"What is the State?" was one of his questions. This question has been answered scientifically in the scientific materialist theory of the State, first worked out by Marx and Engels. That theory does analyse the State. It does substitute for a vague and general concept of "the State" a very exact picture of the kind of facts we are referring to when the State is in question. It does enable us to express propositions about the State far more clearly than they could be expressed before. It does give far more ultimate knowledge about the constituents of the State than was possessed before the scientific theory was formulated.

But when the State was studied scientifically by Marx and Engels, they studied the actual exemplifications of State power; they studied the history of the State; they studied the State in its motion, change and development; they studied it in its actual real historical relations—not as an abstract, isolated fixed "concept." Thus they arrived at conclusions which could be actually tested and verified in practice. On the other hand, to sit down and try to work out "a logical analysis of the State" in the abstract, simply out of one's head, could not possibly produce anything but baseless and abstract speculations.

Mr. Wisdom also wanted to know what is the nature of the facts we are referring to when we speak of the Self, or Time, and likewise of tables and chairs, electrons, vitamins, and all other things. To answer him, it is necessary only to say that, whether contemporary science has a complete answer to all

such questions or not, there seems to be no reason to doubt, and every reason to affirm, that it is by the continuation of scientific methods of empirical investigation that we shall be able to answer such questions. Any *other* mode of investigation —a *philosophical* as opposed to an empirical *scientific* mode of investigation—would be quite superfluous and would get us nowhere.

To put the point in a nutshell : When we ask for " deeper," more " exact," more " ultimate " knowledge of the nature of the things to which our knowledge relates, how are we to get it ? We answer :—By scientific investigation, by experiment, by putting forward hypotheses which we can *test* and *verify* and *use*, in a word, by a continuation of the well-tried methods of scientific research. In this way our knowledge does get more and more " exact " and " ultimate "—never *absolutely* exact and ultimate, it is true ; that is a final limit which, so far as we can see, never can be reached, though we may more and more approximate to it.

Now, therefore, it is possible to begin to indicate the basic character of the mistake made in the formulation of the method of logico-analytic philosophy. This method supposes that the more precise, more clear, and more ultimate knowledge which we desire of the nature of things, can be obtained by a purely logical-philosophical analysis, *as distinct from* a continuation of scientific investigation—by passive contemplation as distinct from active investigation.

More ultimate knowledge, it thinks, is not to be obtained by a continuation of scientific investigation, but by going outside science altogether.

Here the place of logic in the system of scientific thought is altogether perverted. Logic is not regarded as an instrument in the hands of science itself, to aid in the criticism and formulation of scientific results. But it is regarded as an instrument for the extra-scientific criticism of science ; that is, for the construction of a philosophic interpretation of the propositions of normal experience and of science, not based on empirical and scientific methods of analysis, but on some sort of philosophical method of analysis.

This postulate of a specialised logical-*philosophical* mode of analysis being needed in order to clarify and interpret the

propositions not only of ordinary uncritical " common sense " but also of science, places the analytic philosophers, incidentally, in rather strange company.

It is not a new doctrine, nor one peculiar to logical analysis, that the empirical investigations of science need to be supplemented by some extra-scientific mode of knowledge, if the ultimate nature of things is to be revealed. This is the view, for instance, of all those theologians who hold that Faith provides some special mode of apprehension. It is also the view of all those idealists who, in the words of Russell, hold that " a-priori reasoning can reveal otherwise undiscoverable secrets about the universe."

The assumption that some purely philosophical investigation of the nature of things was needed, over and above the mode of investigation carried out by science, was criticised long ago by Engels, in connection with the German " naturphilosophie " or " philosophy of nature," which also based itself on this assumption.

The advance of natural science itself, Engels wrote, means that it " no longer needs any philosophy standing above the sciences."[1] And : " Today," he wrote, " when one needs to comprehend the results of natural scientific investigation only . . . in the sense of their own inter-connections in order to arrive at a ' system of nature ' sufficient for our own time . . . this natural philosophy is finally disposed of. Every attempt at resurrecting it would be not only superfluous but a step backwards."[2] That was written in 1888. But if it was true then, it is truer still now.

The logical-analytic philosophers, then, with their postulate of some extra-scientific non-empirical mode of logical-philosophical analysis, call on us to leave the path of science, where all hypotheses and analyses are founded on observation and verified by experience, and to embark on dubious philosophical adventures. Instead of investigating the real world, we are to " construct a world " out of supposedly logically ultimate elements. The " method of analysis " is, in fact, no method of analysis at all, but rather a method of speculation.

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[1] Engels : *Anti-Dühring*, p. 32.

[2] Engels : *Feuerbach*, p. 57.

Indeed, this fact results from the very mathematical constructions in which the " method of analysis " had its first origins.

Russell's derivation of mathematics from logic made its start in the conception of the world as consisting of individuals, with their qualities and relations. Thence he defined " classes," thence " classes of classes," thence the natural numbers, thence the rational numbers, thence the real numbers, thence the imaginary or complex numbers, and so on. The whole of mathematics was represented as a logical construction, proceeding from definition to definition, a purely speculative enterprise, divorced from the real world, from real quantities and motions and relationships. In the same way, if Russell's projected philosophical analysis could be carried out, then starting from the ultimate simple data—whether these are sense-data or whatever they might be—then a world would be constructed by a series of definitions, by an enterprise of philosophical speculation, absolutely unrelated to investigation of the real world.

Such speculations are always barren ; and because they cannot be tested or verified, once embarked upon they always lead to endless empty arguments without conclusion.

This indeed is already the fate of Russell's mathematical speculation itself. Logical and mathematical criticism has led to the conclusion that a system of mathematics cannot be deduced from logic, in the way that Russell attempted. In attempting such a deduction, Russell was compelled to introduce into his " system " several " axioms " and " postulates " for which no justification whatever can be found. And moreover it has been shown that no such set of axioms can be proved to be free of contradiction, a consequence fatal for any " formal system " such as that attempted by Russell. So we are as far away as ever from possessing even a logical analysis of mathematical knowledge, let alone of the whole mass of empirical and scientific knowledge.

Thus in the sphere of mathematics also, it will not do to carry out a logical analysis, attempting to construct a system of pure mathematics by a chain of speculative definitions. To elucidate the foundations of mathematics it is rather necessary to show how mathematics is derived from the investigation of real

quantities and figures and motions : thus alone can we arrive at a conception of what mathematics is truly about, and what is the subject matter it is studying.

The purely speculative character of logical analysis, its absolute inability to arrive at any verifiable conclusions, its whole tendency to lead away from the path of knowledge into the path of empty argument about words, can be further exemplified by the writings of other " analytic philosophers," who followed the lead of Russell, but tried to improve upon Russell's own conclusions.

6. " *Common Sense* " *gets into difficulties*

In an article entitled *A Defence of Common Sense*,[1] G. E. Moore remarked : " I am not at all sceptical as to the truth of . . . propositions which assert the existence of material things : on the contrary, I hold that we all know, with certainty, many such propositions to be true. But I am very sceptical as to what, in certain respects, the correct analysis of such propositions is."

He continued : " It seems to me a surprising thing that so few philosophers . . . have attempted to give a clear account as to what precisely they suppose themselves to know, or to judge . . . when they know or judge such things as ' This is a hand,' ' That is the sun,' ' This is a dog,' etc., etc."

This is the familiar preamble of logical analysis. But unlike Russell, who thought he could carry his analysis straight to the ultimate elements of our knowledge of the external world, Moore approached the analysis in a most cautious and careful way.

" Two things only," he said, " seem to me to be quite certain about the analysis of such propositions (and even with regard to these I am afraid some philosophers would differ from me), namely, that whenever I know, or judge, such a proposition to be true, (1) there is always some *sense-datum* about which the proposition in question is a proposition . . . and (2) that, nevertheless, *what* I am knowing or judging to be true about this sense-datum is not (in general) that it is *itself* a hand, or a dog, or the sun, etc., etc., as the case may be."

After some explanation of the term " sense-datum," Moore

[1] In *Contemporary British Philosophy*, Second Series.

raised the question of completing the analysis. And immediately he got into inextricable difficulties, in the midst of which Engels' words prove very relevant :—" But sound *common sense*, respectable fellow as he is within the homely precincts of his own four walls, has most wonderful adventures as soon as he ventures out into the wide world . . ."—as soon as he gets involved in analysis.

" There seem to me," said Moore, " to be three, and only three, alternative types of answer possible ; and to any answer yet suggested, of any of these types, there seem to me to be very grave objections."

Here are the three types of analysis :—

(1) " What I am knowing really is that the sense-datum *itself* is part of the surface of a human hand."

(2) The second type of analysis is far more complicated. " When I know ' This is part of the surface of a human hand,' what I am knowing with regard to the sense-datum which is *of* that surface is . . . something of the following kind. There is some relation, R, such that what I am knowing with regard to the sense-datum is either : ' There is one and only one thing, of which it is true both that it is a part of the surface of a human hand, and it has R to this sense-datum,' or else : ' There are a set of things, of which it is true both that that set, taken collectively, are part of the surface of a human hand, and also that each member of the set has *R* to this sense-datum, and that nothing which is not a member of the set has *R* to it.' "

(3) " What I am knowing with regard to the sense-datum which is the principal subject of the fact is . . . a whole set of hypothetical facts, each of which is a fact of the form : ' If *these* conditions had been fulfilled, I should have been perceiving a sense-datum intrinsically related to *this* sense-datum in *this* way,' ' If *these* (other) conditions had been fulfilled, I should have been perceiving a sense-datum intrinsically related to *this* sense-datum in *this* (other) way,' etc., etc."

If Moore's three types of analysis have been understood, it will be perceived that the third type roughly corresponds to the philosophy of Berkeley and Hume ; the second type roughly corresponds to the philosophy of Locke ; while the first, and simpler, type roughly corresponds to the philosophy of Mach.

This first and simplest type of analysis was the type of analysis worked out by Russell, which I examined in the first section of this chapter. Moore quite correctly pointed out that several other analyses were equally possible ; " but as to what is the correct analysis . . . there seems to me to be the *gravest doubt.*" And there he leaves the matter. Nor has he resolved these doubts in other of his several published attempts at philosophical analysis.

The position is, therefore, that when the analytic philosopher sits down to do a philosophical analysis, all sorts of different analyses, each more complicated and far-fetched than the last, present themselves ; but the method gives no means whatever for deciding which of them, if any, is the right one, that is, the one which actually corresponds with the facts.

Mr. Wisdom, in fact, in one of his attempts to describe this method, went so far as to say : " We must put the philosophic stimulus in the form, not of a question, but of a prayer—Please give me clearer apprehension of the Arrangement of the Elements in the Fact finally located by the sentence, ' aRb.' "[1] According to Mr. Wisdom, therefore, those who feel " stimulated " to undertake philosophical analysis must seek for truth in prayer ; there is no other way, and the " armchair philosopher " finds himself resting on his knees, rather than on the more usual support of such philosophers. But it is to be feared that even God cannot give him " apprehension " of the " Elements."

Thus on the showing of the analytic philosophers themselves, the logical-analytic method contains no germ of a method for reaching philosophical truth. On the contrary, it is productive merely of baseless and endless speculations.

7. *The Philosophical-Social Tendency of Logical Analysis*

Some years ago Sir James Jeans and the late Sir Arthur Eddington wrote popular books on the interpretation of the results of physical science. But instead of showing to the public how modern science was succeeding in unravelling " the riddle of the universe " and was advancing our knowledge of the constitution of matter and its laws of motion, Jeans and

[1] J. Wisdom : " Ostentation," in *Psyche*, vol. xiii.

Eddington declared that the further the technique of physics advanced, the more mysterious and unknowable did the nature of the real world appear to be. Thus Jeans entitled his book, *The Mysterious Universe*, while Eddington wrote: "Something unknown is doing we don't know what—that is what our theory amounts to."[1]

Analytic philosophers have pointed out that these writings of Jeans and Eddington were extremely muddled and lacking in clear logical analysis. This was very true. And yet the philosophical activity of logical analysis is itself very closely related indeed to the philosophical activity of Jeans and Eddington. They are just two sides of the same process.

Logical-philosophical analysis does for the sophisticated and scientific elite what the crude idealism of Jeans and Eddington did for the unsophisticated general public; namely, it obscures for them the fact that scientific advance is steadily building up a clear materialistic picture of the world, and encourages instead a vague and baseless speculation about "what things are really like," what "lies behind" our empirical knowledge.

It is in this way that logical-analytic philosophy inherits and continues to play the very same philosophical-social role as was played by the philosophy of Berkeley and the others who followed after him.

In the present century, tremendous new advances have been won in all spheres of natural science, particularly in the basic science of physics. People have spoken of "a revolution in natural science." The old mechanistic physics has been superseded; there is a wider completer synthesis of our knowledge of the constitution and laws of motion of matter, and this increased knowledge is at the same time increased power to utilise natural forces for our own ends.

But the same tendency which arose in the 18th century in regard to science continues to operate today. A scientific view of the world cannot be accepted. It contradicts too harshly the traditional notions of a class society. It shows too plainly how, having gained ever wider objective knowledge, men could combine to utilise the mastery over nature which this gives in the interests of the whole of the people. While the uninformed millions remain in relative ignorance and

[1] Eddington: *The Nature of the Physical World*, p. 291.

continue to be doped by varied forms of superstition and irrational teachings, those who are versed in scientific knowledge draw back from the consequences of the advance of science. They begin to philosophise, to interpret, to analyse, to speculate. This is the social significance of the philosophical method of logical analysis.

Corresponding to the advancement of science, and to the generality of its basic theories and the wide extension of its development and applications, the philosophical interpretation of our knowledge by logical analysis takes on an extraordinarily abstract form, plunges into the most complicated speculations, and makes use of pseudo-scientific and pseudo-mathematical expressions in order to construct a world of metaphysical speculation.

In all essentials this speculation is simply a continuation under modern conditions of the old philosophy of Berkeley, Hume, Mach and the rest, which pretends to give an extra-scientific interpretation of the results of science. Whether science is interpreted in terms of " sensations and ideas," or of " elements," " sense-data," or any other of the philosophic concepts in use today, the upshot is the same : to *reject* the clear objective import of scientific knowledge, as an ever-developing and ever more accurate comprehensive picture of the objective world ; to obscure the fact that we have gained and are gaining objective knowledge in relation to which we need, not a speculative interpretation, but an understanding of how to apply it fully to gain a mastery over nature and over our own destinies.

CHAPTER 8

LOGICAL ATOMISM

1. *Logical Form*

A SURVEY of the logical-analytic method needs to be supplemented by some examination of the conceptions of formal logic which provided its basis, and of which it made use in carrying out its attempted " analyses." " Logic," said Russell, " is the essence of philosophy."[1] The speculations and interpretations of knowledge worked out by analytic philosophers all make use of the Russellian system of logic, and the attempts to construct a world by methods of analysis are attempts to construct a world conforming to the postulates of that logic.

Fundamental for Russell's view of logic, and for the whole logic of the modern logical schools, is the idea of *logical form.*

" In every proposition and in every inference," Russell explained, " there is, besides the particular subject matter concerned, a certain *form*, a way in which the constituents of the proposition or inference are put together."[2]

He proceeded to explain by examples what he meant by *the form* of a proposition.

" If I say ' Socrates is mortal,' ' Jones is angry,' ' the sun is hot,' there is something in common in these three cases, something indicated by the word ' is.' What is in common is the *form* of the proposition, not an actual constituent. If I say a number of things about Socrates—that he was an Athenian, that he married Xantippe, that he drank the hemlock—there is a common constituent, namely Socrates, in all the propositions I enunciate, but they have diverse forms. If, on the other hand, I take any one of these propositions and replace its constituents, one at a time, by other constituents, the form remains constant, but no constituent remains. Take (say) the series of propositions, ' Socrates

[1] Russell : *Our Knowledge of the External World*, ch. 2.

[2] Ibid., p. 42.

drank the hemlock,' 'Coleridge drank the hemlock,' 'Coleridge drank opium,' 'Coleridge ate opium.' The form remains unchanged throughout this series, but all the constituents are altered. Thus form is not another constituent, but is the way the constituents are put together. It is forms, in this sense, that are the proper objects of philosophical logic."[1]

To this must be added, that the logical form of a proposition is not necessarily expressed adequately by the form of words in which the proposition is usually expressed in ordinary speech or writing.

Take, for instance, these three propositions :—

"Socrates is mortal."

"The philosopher who drank the hemlock is mortal."

"All men are mortal."

They all appear, linguistically, to have the same form, namely, the subject-predicate form. Linguistically, it would appear that these three propositions each assert the predicate "mortal" of the respective subjects, "Socrates," "the philosopher who drank the hemlock," and "all men."

Such was, indeed, the view of Aristotle, who thought all propositions were of a subject-predicate form. But Russell was at pains to point out that this is not the case.

Thus Russell would contend that, of the three propositions mentioned above, only the first is a simple subject-predicate proposition ; the third is a generalisation, and the second is another form of proposition involving a "description." All three propositions are of different logical forms, though this may not appear in their ordinary verbal expression.

Thus in the first proposition, "Socrates" *stands for* a certain individual, a man, and "mortal" *stands for* a certain property, which is predicated of that individual. It is a genuine subject-predicate proposition. But in the second proposition, the *description*, "the philosopher who drank the hemlock," does *not* stand for an individual, in the way that a *name*, such as "Socrates," stands for an individual. (This is shown by the fact that we can formulate descriptions of things which do not exist ; obviously such descriptions could "stand for"—nothing.) Thus, in point of logical form, the second

[1] Russell : *Our Knowledge of the External World*, pp. 42, 43.

proposition does *not* predicate any property of an individual subject. Its correct logical form will rather be revealed by re-wording it in an expanded form, thus : " There exists an individual, such that he is a philosopher, he drank hemlock, and that individual is mortal." So again with the third proposition. The phrase " All men " does *not* denote *an individual subject*, like the name " Socrates." The correct logical form of " All men are mortal " will only be revealed by re-wording it, thus : " For every individual, if he is a man, then he is mortal."

From this Russell drew the conclusion that normal linguistic expression often conceals and confuses, rather than reveals and makes manifest, the logical form of the propositions it is intended to express.

It follows that when we come to philosophise about our knowledge, this fact inevitably gives rise to many errors, unless we are aware of it. And most traditional philosophy, according to Russell, consisted of just such errors. On the other hand, such errors are corrected, and philosophy finds its true vocation, in the process of logical analysis—subjecting our knowledge to logical analysis which reveals the correct logical form of the propositions which we know. Such logical analysis needs to have as its main instrument a logical theory of the nature of propositions and of the different forms of propositions.

2. *Analysis of the Forms of Propositions*

In his works on formal logic, and notably in the *Principia Mathematica*, Russell worked out the main series of the logical forms of propositions. His work in this sphere was further perfected by Wittgenstein, in his *Tractatus Logico-Philosophicus*.

The three main forms of propositions (according to this analysis) are :—(1) Elementary Propositions, (2) Truth-Functions of Elementary Propositions, (3) Generalisations. The basic conception is that of an Elementary Proposition, and all the other forms of propositions are derivable from Elementary Propositions by a series of simple logical operations. I shall deal here only with so much of the Russell logic as is strictly necessary to understand the philosophical superstructure which has been erected on the basis of this analysis.

(1) *Elementary Propositions*

The simplest form of elementary proposition (according to this analysis) is the simple subject-predicate form, which we may express :—

s is p.

Here s stands for any simple subject, and p for any simple predicate that may belong to it. For instance :—

" This is red,"
" Socrates is mortal,"
" Churchill is mortal."

The simplest form of elementary proposition, then, asserts a characteristic of a single individual. The next form asserts a relation between two individuals. Thus we get a second form of elementary proposition :—

a R b

where a and b are individuals, and R is some relation between them. For instance :—

" This is redder than that,"
" Churchill conferred with Stalin."

But there can be relations between more than two individuals. This is immediately apparent in the example of Churchill. For instance :—

" Churchill conferred with Stalin,"
" Churchill conferred with Stalin and Roosevelt,"
" Churchill conferred with Stalin, Roosevelt and Chiang-Kai-Shek."

These are all elementary propositions, but the first expresses a relation between two terms, the second between three terms, and the third between four terms. There is in fact no limit to the number of terms that can enter into a relationship. To carry forward the same type of example : suppose an organisation holds a conference attended by 1,000 delegates ; here there are 1,000 people conferring together, in other words, a relationship between 1,000 terms.

It will now be convenient to introduce a different symbolism for expressing the forms of elementary propositions. Instead

of writing as above " a R b," we shall adopt the familiar functional symbolism of mathematics, and use it in logic. Thus we shall write :—

$$R\ (x, y)$$
$$R\ (x, y, z)$$
$$R\ (x, y, z\ \ldots)$$

for any number of terms. And similarly, instead of " s is p," we can just write the " function " :—

$$f\ (x).$$

Such expressions as these Russell called " Propositional Functions." Thus f (x), R (x, y), etc., do not assert anything, and are not themselves propositions ; but when values are given to the variable symbols contained in these functional expressions, then the result is an elementary proposition of a certain form, for instance : " Churchill is mortal," and " Churchill conferred with Stalin."

Thus the propositional function expresses the pure logical form of a proposition. And thus finally we may represent the series of elementary forms of propositions by means of the series of propositional functions :—

$$f\ (x),\ f\ (x_1, x_2),\ f\ (x_1, x_2, x_3),\ f\ (x_1, x_2, x_3\ \ldots x_n),\ \ldots$$

The invention of the propositional function was of great importance in Russell's development of logical theory.

(2) *Truth Functions*

Now comes another series of forms of propositions. Let us express elementary propositions, of whatever forms, by the variables " p," " q." Then at once we discover a new form of proposition, which is obtained by the simple and familiar operation of negation. This is the negative proposition, which is just simply the denial of an elementary proposition. For example : " Churchill is not mortal," " Churchill did not confer with Stalin," or " This is not red." The form of all such negative propositions is expressed in the simple functional expression :—

" not-p."

A proposition of the form " not-p " can obviously be

defined as a proposition which is true when " p " is false, and false when " p " is true.

Thus a proposition of the form " not-p " can be very aptly termed a " Truth Function." For it can be defined in terms of the truth or falsity of the elementary proposition from which it is constructed.

Thus we find the beginning of a new series of forms of propositions, which are not in form elementary propositions at all, but are of a higher form—truth functions of elementary propositions.

The negative form of proposition, " not-p," is, then, the simplest form of truth function. But the continuation of the same operation whereby " not-p " was derived from the elementary proposition, " p," will simply restore again the original proposition, " p." Thus " not-not-p " is exactly the same as " p." But if now, instead of operating with only the one elementary proposition, " p," we take two, " p " and " q," we can again obtain further forms of truth functions—for example, compound propositions of the forms:—

" p implies q,"
" either p or q,"
" not both p and q,"
" p and q."

Logicians have given many accounts of such compound propositions. But according to Russell they are simply truth functions. According to Russell, and this thesis was developed in detail by Wittgenstein, such forms of compound propositions can be defined exclusively in terms of the truth or falsity of the elementary propositions from which they are constructed.

Thus, just as " not-p " can be defined as the proposition which is true when " p " is false and false when " p " is true, so, for example, can " p implies q " be defined as the proposition which is false when " p " is true but " q " is false, but which otherwise is true. Thus " p implies q " says that, as a matter of fact, whenever " p " is true, " q " is true as well. All that it says can be defined in terms of the truth or falsity of the elementary propositions which are its constituents, or from which it is constructed. Again, " p and q " can be

defined as the proposition which is true when " p " is true and " q " is true, but which otherwise is false. And so on.

There is no need to go into detail about all the truth functions which can now be constructed ; for quite clearly, we can now construct truth functions of any order of complexity.[1]

It is interesting to note, however, certain consequences which follow from this logical analysis of truth functions.

Thus in the first place, certain forms of expressions turn out to be exactly equivalent one with another. For example, " not both p and q " and " p implies not-q." If we work out the definition of these two expressions in terms of the truth or falsity of their constituents, " p " and " q," we will find that the result is the same in both cases—namely, both these compound expressions are defined as being false when " p " and " q " are both true, but otherwise as being true. They are therefore exactly equivalent. Hence there are many different ways of expressing exactly the same proposition. The equivalence of " not-not-p " with " p " is another example.

And further, this logical analysis claims to throw considerable light upon the logical nature of deductive inference.

For instance, if I know that " p implies q," and that " q implies r," I can infer deductively that " p implies r." If I have established the first two propositions, no further investigation is needed to establish the third. This is explained from the fact that, if I work out the logical conditions for the truth of " p implies q " and " q implies r," I will find that these conditions include the conditions for the truth of " p implies r." Therefore, if I have discovered from observation that " p implies q " and that " q implies r," it needs no further observation to discover that " p implies r," for this is contained in what I have discovered already.

(3) *Generalisations*

Thirdly, by further operations with either elementary propositional functions or with truth functions, we arrive at a further series of forms of propositions, which may be called " generalisations."

[1] In *Principia Mathematica* Russell includes truth functions as "elementary" propositions. He calls them "molecular" as distinct from "atomic."

There are two types of generalisations, or two operations by means of which generalisations may be constructed :—

(i) The assertion of something of *every* x.
(ii) The assertion of something of *some* x, or of at least one x.

Let us take a propositional function, f (x). Then we can obtain generalisations from it by asserting : (i) of every x, that f (x) ; (ii) of some x's, or of at least one x, that f (x). Let us express these generalisations :—

(i) $(x).\ f(x)$
(ii) $(\exists x).\ f(x)$

Two examples of such generalisations are : " All men are mortal," and " Some men are philosophers." How these two propositions are examples of the general form of propositions can be seen by writing them :—

$(x).$ x is a man implies x is mortal.
$(\exists x).$ x is a man and x is a philosopher.

Clearly, generalisations of any order of complexity can now be obtained from propositional functions by means of the two simple operations " for every x " and " there is an x," expressed by the operators (x) and ($\exists$x.).

Such, then, is the catalogue or classification of the forms of propositions according to the Russell-Wittgenstein logic. It will be seen that all the forms are obtainable by means of a few simple logical operations from the elementary propositional function.

Before proceeding further, two remarks may be made on some consequences of this theory of generalisations.

First of all, the logical expansion, or re-writing, of " All men are mortal," as " For every x, x is a man implies x is mortal," provides a good example of the way Russell thought logical analysis cleared up philosophical confusions. Thus if a philosopher were to think—as many have thought—that " All men are mortal " was not a generalisation, but a proposition of a subject-predicate form, then he may be led to suppose that, besides particular men, there also exists a very mysterious sort of object, namely, " all men," or " the class " of men. Thus as well as Tom, Dick and Harry, he will postulate a transcendent reality, Mankind, or something of

that sort, and will begin to spin out many strange and misleading theories about it. But if such a philosopher can only be brought to understand the correct logical analysis of " All men are mortal," then he will see that the only things it refers to are particular concrete individuals, with their characteristics and properties, and that his supposed " all men " or " the class of men " or " mankind " is a mere fiction, that disappears in analysis.

Secondly, if we ask : on what does the *truth* of a generalisation depend, the answer is that its truth depends entirely on the truth or falsity of the elementary propositions which are its *instances*.

Just as the truth of a truth function depended on the truth or falsity of the elementary propositions which were its constituents, so the truth of a generalisation depends on the truth or falsity of the elementary propositions which are its instances.

In general, then, the truth of every form of proposition depends on the truth of elementary propositions ; for the higher forms of propositions are only constructed by means of logical operations with elementary propositions.

For example, the truth of the generalisation " All men are mortal," depends on that of a whole series of elementary propositions, which can be called the instances of that generalisation ; thus, " Tom is mortal," " Dick is mortal," " Harry is mortal," " Churchill is mortal," " Stalin is mortal," and so on.

Thus if we want to establish the truth of any generalisation, we can only do so by, as it were, turning up all its instances, to find if they are true. Thus, to establish that all men are mortal, we must establish that Tom died, that Dick died, that Harry died, and so on for all men. But as there is very often no limit to the number of instances of a generalisation, and as a generalisation very often continually refers into the future, so that in however many instances we might verify it, fresh verification will always be required, it follows, that not only is it often practically impossible to establish the truth of a generalisation, but it is often logically impossible as well. Thus truth, in an absolute and unconditional sense, does not apply to generalisations, as it applies to elementary propositions.

This can be expressed by saying that generalisations are not strictly speaking propositions at all, as understood by those traditional logicians who define a proposition as " that which is either true or false " ; but they are rather of the nature of formulæ, or rules, or predictions, for saying which elementary propositions may be expected to be true.

This has an obvious application to the propositions of science. For instance, the law of gravitation is not an absolute truth, but it is rather of the nature of a useful rule for the construction of a number of elementary propositions, each one of which will tell us the particular gravitational attraction to be found operating in a particular system of bodies.

3. *What is a Proposition ?—The Pictorial Theory*

I have now attempted to demonstrate the elements of the logical apparatus by means of which Russell proposed to reform philosophy, and to solve philosophical problems, by the method of logical-philosophical analysis. But it will be found that this apparatus at once begins to produce some strange results.

Everyone familiar with logical theory must agree that the Russell system of formal logic represented a significant advance, as compared with the traditional Aristotelian logic. For Aristotle, all propositions were subject-predicate propositions, and all inference was syllogistic. Russell's analysis provided a far more comprehensive theory of the forms of propositions and of deductive inference.

In taking the subject-predicate form as the essential form of all propositions, Aristotle was regarding the main function of propositions as being the subsumption of individuals within a class. His logic corresponded to the level of development of the science of his time, which still moved to a great extent within the stage of classification. Russell, rather more than 2,000 years later, was concerned with the development of a system of formal logic which would embrace, not merely the classification of things within their appropriate classes, but the relations between things, and their dependence one on another. Hence his insistence on the " propositional function " " R (x, y . . .) " as being the typical form of elementary

proposition, rather than the simple Aristotelian " S is P " ; his development of the theory of truth functions ; and his theory of generalisations, involving the use of the mathematical idea of variable terms.

But nevertheless, in carrying out this extension and elaboration of logical theory, Russell's logic remains within the Aristotelian tradition. For both, a proposition is essentially an arrangement of terms whose logical nature is defined by the Aristotelian laws of Identity, Non-Contradiction and Excluded Middle. That is to say, if A is the object denoted by any term, then A is just exactly A and not anything else, we cannot have both A and not-A, and we must have either A or not-A. For Aristotle, the world consisted of fixed individual things, each and all of which could be classified according to its definite properties. Russell, in carrying out his elaboration of logical theory, does not overcome this metaphysical standpoint. If Russell writes " R (x, y . . .) " then " x " and " y " stand for definite individual things, and " R " for a fixed relationship which does or does not hold between them.

Thus the Russell logic, like the Aristotelian, involves far-reaching " metaphysical " presuppositions and " metaphysical " implications.

For the logical theory is based on a certain view of the nature of a proposition, and its correspondence with what it signifies. A proposition is a definite arrangement of terms, and those terms stand for definite objects—for individuals, their characters and relations. If a term does not stand for an object, then it can be given no meaning in the proposition. The objects are combined in fact in a definite way : individuals are related by certain relations and not by others, an individual has a certain character and not another character. If the terms in the proposition are combined in a way corresponding to that in which the objects that they stand for are combined in fact, then the proposition is true ; and otherwise it is false.

The development of the theory, implicit in the Russell logic, of the nature of propositions and of their correspondence with facts (or of truth and falsity) has been most clearly and consistently developed by Wittgenstein, in his *Tractatus Logico-Philosophicus*.

Dealing particularly with the basic form of proposition, the

elementary proposition, Wittgenstein said that *a proposition is a picture of a fact.*

" We make to ourselves pictures of facts," he said. " The elements in the picture stand, in the picture, for the objects. That the elements of the picture are combined with one another in a definite way, represents that the things are so combined with one another."[1]

He went on to explain that : " What every picture, of whatever form, must have in common with reality in order to be able to represent it at all—rightly or falsely—is the logical form, that is, the form of reality."[2]

Thus : " The picture agrees with reality or not ; it is right or wrong, true or false."[3]

And : " In order to discover whether the picture is true or false we must compare it with reality. It cannot be discovered from the picture alone whether it is true or false."[4]

He went on to say that : " The logical picture of the fact is the thought." And : " The thought is the significant proposition."[5]

So the (elementary) proposition is a certain arrangement of terms ; and that the terms are arranged in a certain way in the proposition, says that the objects which those terms signify are correspondingly arranged in the fact. If the objects are so arranged in fact, the proposition is true ; otherwise it is false.

Such is the simple, and, to use a mathematical phrase, elegant, theory of the nature and signification, or truth and falsity, of propositions, which is implicit in and results from the formal logical analysis.

A proposition is a picture of a fact, and the relation between proposition and fact is a pictorial relation.

This seems to accord with the very strictest empiricism. Whether a proposition is true or false must be discovered by examining the facts. " There is no picture which is a-priori true."[6]

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[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 2.131.15.

[2] Ibid., 2.18.

[3] Ibid., 2.21.

[4] Ibid., 2.223.224.

[5] Ibid., 3, 4.

[6] Ibid., 2.225.

But for all that, the pictorial theory entails consequences respecting the nature of facts ; more exactly, consequences respecting the " logical structure " of facts, the " logical structure " of the world. Having begun with the forms of propositions, we find ourselves dealing with " the form " of the world. We began with logic, but it has led into metaphysics.

4. *Logical Atomism—a system of metaphysics*

From a logical analysis of propositions, Wittgenstein, in complete accordance with the Russell logic, arrived at a logical analysis of the form of the world. (In his *Tractatus* he started with the latter analysis, which is one of the things that makes this book unnecessarily hard to understand.)

" The world is everything that is the case," said Wittgenstein, and went on to explain what he meant by this. " The world is the totality of facts, not of things. The world divides into facts. Any one can either be the case, or not be the case, and everything else remain the same."[1]

Just as the elementary propositions are the basic sort of propositions, from which all other forms of propositions can be constructed, so, corresponding to the elementary propositions, and " pictured " by them, there are elementary—or " atomic " —facts. Each is logically independent of every other.

And so the logical-metaphysical analysis continues :

" What is the case, the fact, is the existence of atomic facts. The totality of existent atomic facts is the world. Atomic facts are independent of one another. From the existence or non-existence of an atomic fact we cannot infer the existence or non-existence of another."[2]

And just as elementary propositions are combinations of terms, so atomic facts are combinations of objects. And just as the terms by themselves have no meaning except in so far as they can be combined in propositions, so the objects have no existence apart from their combination in facts.

" An atomic fact is a combination of objects (entities, things). It is essential to a thing that it can be a constituent part of an atomic fact."[3]

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[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 1.1.2.21.
[2] Ibid., 2.04.061.062.
[3] Ibid., 2.01.011.

Further : " The object is simple. Objects form the substance of the world. Therefore they cannot be compound." And : " In the atomic facts objects hang one in another, like the members of a chain. In the atomic fact the objects are combined in a definite way. The way in which the objects hang together in the atomic fact is the structure of the atomic fact."[1]

Turning back now to Russell, the same view of " the nature of the world " is to be found expressed in more popular and easily comprehensible—if less " scientifically accurate "—language :

" The existing world consists of many things with many qualities and relations. A complete description of the existing world would require not only a catalogue of the things, but also a mention of all their qualities and relations. We should have to know, not only this, that and the other thing, but also which was red, which yellow, which was earlier than which, which was between which two others, and so on. When I speak of a ' fact,' I do not mean one of the simple things in the world ; I mean that a certain thing has a certain quality, or that certain things have a certain relation."[2]

It emerges, therefore, from the logical theory of the forms of propositions, which postulates the elementary proposition as the basic form of proposition, and as a picture of the fact, that the world itself is of a certain form. The world consists of " atomic facts," each of which is independent of every other. And the constituents of these " atomic facts " are " simple objects."

This general view of the basic logical structure of the world, derived from formal logic, has been aptly called " Logical Atomism."

But this remarkable result was not reached by any process of generalisation from the mass of empirically verified results of science. Indeed, it has, and can claim to have, no empirical foundation whatever. It is deduced from pure logic.

It turns out, therefore, that the logicians and analytic philosophers who differentiated themselves so carefully from " the classical tradition," and who overthrew that tradition by

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 2.02.03.031.032.

[2] Russell : *Our Knowledge of the External World*, p. 51.

a Galilean revolution, have not really departed from " the classical tradition " by a single inch. Their's too is a case in which " a-priori reasoning reveals otherwise undiscoverable secrets about the universe." For by no other method could they have discovered such a " secret " as that the universe consists of simple objects, arranged in atomic facts, each of which is absolutely independent of every other.

Whether the universe is really like this is, indeed, on merely empirical evidence, more than doubtful. Observation and experiment have never yet revealed any atomic fact or simple object.

The standpoint of logical atomism, a purely metaphysical standpoint, based on no evidence but resting on pure a-priori grounds, comes out into sharp relief, and is given a clear and uncompromising formulation, as a result of the development of the Russell logic. But at the same time it is not difficult to see that this standpoint only brings out and makes explicit assumptions that were already implicit in the philosophy of pure empiricists, long before logical analysis arrived on the scene, with its " clarifying " mission.

Already when Locke defined " an idea " as " whatsoever is the object of the understanding when a man thinks," and went on to distinguish elementary simple ideas, and to regard the whole of knowledge as a compounding of simple ideas, he was preparing the way for the standpoint of logical atomism. Hume's philosophy introduced the most complete and rigid atomism as regards the objects of knowledge. For Hume the only realities we were cognisant with were analysable into simple " impressions and ideas," each independent of every other. Thus the standpoint of logical atomism, based on Russell's system of formal logic, does no more than bring out and make explicit the logic already implicit in the philosophy of pure empiricism. In the same way, the logical-analytic method of philosophy itself was seen to be no more than a repetition in new terms of the pure empiricist interpretation of our knowledge.

5. *Critique of Logical Atomism*

The standpoint of logical atomism obviously stands or falls by the concept of the elementary proposition, and of the atomic fact which is signified by an elementary proposition.

All other forms of propositions (truth functions and generalisations) are derived from elementary propositions by simply defined logical operations ; and the unique importance, in this system, of the elementary proposition can be seen in the following way.

It is clear that (from the standpoint of logical atomism) *everything* that is the case, the *whole* truth about the world, is expressible in a set, or in a series, of elementary propositions. An enumeration of all true elementary propositions would be a complete picture of the world, of all facts, and would leave nothing else to be said. It would be found that the truth of all other true propositions—truth functions and generalisations—was already contained in that of the elementary propositions.

For instance, imagine a very simple " world," answering to the basic postulates of logical atomism, and having as its constituent " objects " just two individuals, called " a " and " b," two qualities, called " p " and " q," and one relation, called " R."

Suppose further that the following elementary propositions are true of this world :

" a is p,"
" b is q,"
" a is R to b,"
" b is R to a."

For instance : " a is red, b is green, a is unlike b and b is unlike a."

Then, having enunciated these elementary propositions, we have a complete picture of the world. Nothing further that may be said will add anything new to the picture.

For, having enunciated these elementary propositions, the truth of a number of truth functions and generalisations about the world can be immediately deduced : it can be deduced because all that these truth functions and generalisations have to say about the world is already contained in the elementary propositions. The same few atomic facts which make true the elementary propositions, also make true the truth functions and generalisations.

For example, here are some of these truth functions and generalisations :

" a is not q,"
" b is not p,"
" a is p and b is q,"
" a is p implies a is not q,"
" for every x, x is p implies x is not q,"
" there is an x, x is p and x is not q,"
" for every x, y, xRy implies yRx."

Or : " a is not green ; b is not red ; a is red and b is green ; that a is red implies that a is not green ; if anything is red, then it is not green ; there exists at least one individual, such that it is red and not green ; for any two individuals, x and y, if x is unlike y then y is unlike x."

The example of this very simple " world," which just consists of four atomic facts, and the complete truth about which is accordingly expressible in four elementary propositions, can be generalised for the case of any world that consists of atomic facts, however many such facts may be the case in it. The complete truth about the world, according to logical atomism, is expressible in elementary propositions.

Such being the conclusion of logical atomism, which absolutely certainly and infallibly follows from the Russell-Wittgenstein system of formal logic, it is necessary to apply this conclusion in the domain of our actual knowledge, in order to see what progress can be made in expressing known facts in the form of elementary propositions. Having, so to speak, completed the process of construction in the shipyard of logical theory, it is necessary to launch the logical ship upon the ocean of actual experience. But when this launching is carried out, it is found that the ship is so constructed as to be unseaworthy and it immediately sinks and disappears.

The complete truth about the world is expressible in elementary propositions. If that is really so, then let us proceed to express it, or at least a part of it, in elementary propositions, bearing in mind that an elementary proposition is one which is (*a*) logically independent of any other proposition, and (*b*) is the statement of an atomic fact. Can this enterprise be carried out ? The answer is that it cannot.

Not much help is to be received from the actual exponents of logical atomism, for they have never thought it necessary to furnish even a single example of an elementary proposition. For my part, I have often searched, and searched in vain, both in my inner consciousness and in my consciousness of the outside world, for an elementary proposition. But I have never found one. And reflection shows that no one else is likely to be more fortunate.

Take for instance propositions about material objects—" This flower is red," " This stone is heavy," " This man is fat," etc. ; or : " This is a flower," " This is a stone," " This is a man." Such propositions are certainly expressed in the elementary form, " s is p " ; but they are not absolutely elementary propositions. They certainly do not state atomic facts ; they are not logically independent of any other propositions. For things like flowers and stones and men, and their qualities like being red and being heavy and being fat, are not simple and unanalysable things and qualities ; so facts involving such things and their qualities, and propositions stating such facts, are neither atomic nor elementary, in the logically absolute sense.

Is the case any better if we try to deal with propositions, not about things on the ordinary perceptual level, but about the ultimate constituents of the material world ? No, this line of research holds out no hopes for the seeker after elementary propositions. The most ultimate constituents of the material world that have been discovered up to the present consist of things like electrons ; but we cannot formulate elementary propositions about them. We cannot say, " this electron," and pin that name on to one particular simple and unanalysable individual ; and even if we could, we could not ascribe simple and unanalysable qualities and relations to such individuals.

One line of logical thought has tried to find, not in " things " but in " events " the ultimate logical or metaphysical constituents of the world. But here again, what is to be included in one single event is altogether arbitrary, nor can precise and simple qualities and relations be ascribed to events. There may be sense in a " logic of events "—but it could not be an atomistic logic. In the search for something logically-metaphysically simple and ultimate, " events " are sometimes

whittled down to " point-events," or " point-instants " ; and the ultimate elementary propositions would then be infinite in number, expressing the ultimate qualities and relations attached to every point-instant in the total system of space-time. But yet it is clear that point-instants, and the properties of matter at a point-instant, are not ultimate logical-metaphysical constituents of the world, but could only be defined by means of an elaborate process of mathematical analysis.[1] No elementary propositions about point-instants could possibly be formulated.

In general, then, the conclusion emerges that no proposition about the material world, and material objects, as ordinarily understood, can possibly be a logically elementary proposition, in the sense required by logical atomism.

But can we perhaps formulate elementary propositions which refer, not to the objective material world, but to the content of one's own immediate experience ?

The hunt for elementary propositions is very like the Hunting of the Snark. We must seek them " in some place unfrequented by man " ; since in general people do not formulate propositions exclusively about their own immediate experiences.

Suppose then I say, " I am seeing something red." Can a proposition such as this be a logically elementary proposition ? Evidently not : for even if " something red " can be regarded as an ultimate constituent of the world of experience, the term " I " and the relation of " seeing " cannot possibly be regarded as ultimate, simple and unanalysable. An elementary proposition which refers to immediate experience would have rather to be sought in such expressions as : " Red here-now " ; where " red " stands for the simple object, a colour, that I am immediately aware of, and " here-now " stands for another simple object, its position in my " visual field." Here at last, perhaps, is an absolutely elementary proposition ; here at last, perhaps, the logical snark is entrapped in its lair in the regions of immediate experience.

But suppose someone really did say, " Red here-now." What would he be understood to mean ? Clearly, he would be understood to mean that he was seeing something

[1] Cf. Whitehead : " The Method of Extensive Abstraction," explained in his two books, *The Concept of Nature* and *The Principles of Natural Knowledge*.

red ; what he would be understood to mean would be something rather indefinite, and certainly not a logically elementary proposition. So if a logical atomist were to make this remark, he would have to explain that what he would be understood to mean by it was something different from what he " really " meant ; for what he " really " meant would refer to alleged objects contained in his own immediate experience, which would be absolutely inaccessible to anyone else. So what *would* he " really " mean ? The answer is—nothing. What he would be trying to say would be something incommunicable, which is only to say that he would be saying nothing at all. Hence, just like the snark, the logically elementary proposition continues to be absolutely elusive.

I think it would be futile to hunt further for logically elementary propositions. It can be positively asserted that no one has ever produced an example of one, and any attempt to do so leads to such stupid discussions as to provide abundant proof that the whole conception is unreal and artificial. Elementary propositions, in the logically absolute sense required by logical atomism, have therefore no relevance at all to the analysis of actual processes of thought, or to the expression of actual facts about the world.

When the elementary proposition and the atomic fact turn out to be mythological creations, the bottom falls out of the system of logical atomism.

It may now be remarked that the theory of logical atomism, like all metaphysical theories, obviously takes a very simplified view of the nature of the world. It supposes that the world divides up into ultimate atomic facts. But no experience and no science has ever given us grounds for accepting such a simplified view of the world. On the contrary, it seems as if the most general characteristic of reality is change and movement, so that never, at any stage of analysis, can we claim to have reached some absolutely fixed " object " which constitutes the ultimate " substance " of the world, as Wittgenstein once expressed it. Wittgenstein said : " Objects form the substance of the world. Therefore they cannot be compound." But yet, every substance resolves into a complex of changes and motions.

Hence whenever, for some particular purpose, we can

legitimately express a certain fact in terms of a proposition which asserts that some object has a certain quality or stands in certain relations, exactly the same fact can also be expressed in other terms, in which the unity and simplicity of the object and its qualities and relations is resolved into multiplicity.

A quality can always be expressed as a relation ; relations can be expressed as qualities ; objects can be represented as complexes of processes ; processes can be represented as objects ; and so on.

None of these modes of representation is *the* truth about the world ; rather, that they are all possible, expresses the infinite multiplicity and changefulness of the world.

Further, in the changing world one event arises out of another, processes interpenetrate and modify one another, nothing exists in isolation, but everything is modified and changed by its relationships with other things. To all this the atomistic view of the world stands in strange contrast. It states in the most rigid way the original view of Hume, when he said : " All events seem entirely loose and separate. One event follows another, but we can never observe any tie between them. They seem conjoined, but never connected." The dynamic flow and interpenetration of processes which we find in the world is artificially disrupted into separate unconnected atomic events or facts, each of which is supposed to be capable of expression in a proposition logically independent of every other proposition.

Thus the thesis of logical atomism, that the whole truth about the world is expressible in elementary propositions, each expressing an atomic fact, each logically independent of every other, is completely untenable.

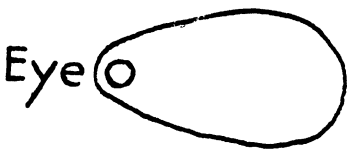
Further, I have already remarked above that the system of logical atomism does no more than bring out and make explicit the logic already contained in the philosophy of pure empiricism, in the philosophy of Hume in particular. It is indeed the proper logic of a philosophy of pure empiricism.

Thus for pure empiricism, the objects of our knowledge are confined to the contents of pure immediate experience. All knowledge, all truth, all scientific theories and scientific laws, are to be interpreted as referring to the order and connections of our subjective sensible experience. How is this expressed

in terms of logical theory? Precisely that the totality of elementary propositions expresses the totality of the facts of pure experience; the whole superstructure of more general propositions, in the form of truth functions and generalisations, refers to no other facts.

I want to remark on one more curious consequence of this theory. Who is the knower, and the scientist, who, in the system of logical atomism, understands the elementary propositions, perceives their truth by comparing them with the atomic facts, and derives from them the general superstructure of truth functions and generalisations? Referring once again to the simple example of the "world" consisting of four atomic facts, it is very obvious in this model that the *subject* who cognises these facts does not exist *in* the world at all, but looks into the world, as it were, from *outside*. So in general, if we suppose the world to consist of atomic facts, and the whole of truth to be expressible in elementary propositions, what has been left out of the picture is the subject, the mind or ego, that formulates the picture and understands it. The knowing mind is outside the known world. The knower plays no part in the world.

Absolutely in accordance with this, Wittgenstein, in a curious passage in his *Tractatus*, says: "The thinking, presenting subject; there is no such thing. . . . The subject does not belong to the world but is a limit of the world. Where *in* the world is a metaphysical subject to be noted? You say that this case is altogether like that of the eye and the field of sight. But you do *not* really see the eye. And from nothing in the field of sight can it be concluded that it is seen from an eye. For the field of sight has not a form like this:



"[1]

I endeavoured to show in an earlier chapter how the general philosophy of pure empiricism takes a view wherein knowledge arises simply from the passive contemplation of given facts by

[1] Wittgenstein: *Tractatus Logico-Philosophicus*, 5.631.633.

the individual mind ; not from the interaction of the knowers and the known, those who gain knowledge being themselves a part of the world, and gaining knowledge through the practical activity of changing the world. In the same way the general theory of logical atomism, the logic of pure empiricism, constructs a logical model of the world which allows no place in the world for the knowing subject and his activity.

To summarise :

The whole standpoint of logical atomism (which derives all forms of propositions from the basic form of the logically elementary proposition, and which implies that the whole truth of the world is expressible in elementary propositions, each stating an atomic fact and each logically independent of every other) is untenable, because it is impossible to find any atomic fact in the world, or to formulate any elementary proposition satisfying the postulates of the logical theory.

This logic leads to and is based on a view of the known world which supposes it to divide into atomic facts—" entirely loose and separate . . . we can never observe any tie between them "—and a view of knowledge which bases it on passive contemplation and allows no place for the knower and his activity within the known world. Neither this view of the world nor this view of knowledge has any basis in actual experience. Both the one and the other are artificial abstract theoretical constructions.

CHAPTER 9

THE PHILOSOPHY OF WITTGENSTEIN

1. *Drawing a Limit to Thinking*

I HAVE already indicated something of the contribution made by Wittgenstein in the development of the logical standpoint of Russell ; particularly his elaboration of the " pictorial " theory of propositions, elementary propositions being regarded as " pictures " of facts.

But if Wittgenstein, in his *Tractatus Logico-Philosophicus*, developed, sharpened and refined the basic logical conception of the proposition as employed in the Russell logic, he also thought that he could carry much further Russell's application of logical theory in the solution of the problems of philosophy.

Take, for instance, " the problem of the external world " : *Is* there an external world, and if there is, of what does it consist, what are its ultimate elements ? Russell thought that this problem could be answered by working out the logical analysis of propositions referring to external objects. But, as I have shown, neither he himself nor his colleagues and followers, ever succeeded in reaching agreement on any analysis which could be said to definitively answer the " problem."

In the light of his further analysis of the basic logical nature of propositions, Wittgenstein thought that such " problems " could be treated in quite another way. For instance, philosophers have argued continually as to whether propositions about material objects refer merely to the order of sensations or " sense-data," or whether they refer to independently existing objects external to consciousness or experience.

Russell would pose this as the question : Which is the right way of analysing propositions about material objects ? Wittgenstein replies that if you understand the logical nature of propositions, you cannot ask such a question. A significant proposition is *a picture* of the facts, which can be *compared* with the facts to test whether it is true or false. So when one

philosopher says : " This material object is a complex of sense-data," and another philosopher says : " This material object is not a complex of sense-data, but exists independent of all sense-data "—of what facts are these two assertions pictures, and how are they to be compared with facts to test which is the truth and which is falsehood ? Both assertions are revealed as pseudo-assertions, pseudo-propositions, which may appear to be significant to persons who do not understand logic, but which an understanding of logic reveals as insignificant.

The " problem of the external world," therefore, as presented by Russell and other philosophers, is not to be solved by working out either one or another " analysis " of propositions about external objects. But it is solved by showing that the whole way in which the problem is put is based on a misunderstanding of the basic logical nature of propositions ; or, as Wittgenstein expresses it, " of the logic of our language."

Thus in the Preface to his *Tractatus Logico-Philosophicus*, Wittgenstein summed up his philosophical aim as follows :—

" This book deals with the problems of philosophy and shows, as I believe, that the method of formulating these problems rests on the misunderstanding of the logic of our language. . . ."

For Wittgenstein, therefore, the task of philosophy is to analyse the logic of our language. And this means, to elucidate the logical principles which determine what forms of words are significant and what insignificant, and to elucidate the logical principles which determine what forms of questions can be significantly asked and answered, and what cannot be significantly asked, and cannot be answered.

It is in this way that he maintained that " the problems of philosophy " are " in essentials finally solved." But they are solved by showing that they are not real problems at all, because they " rest on the misunderstanding of the logic of our language." The formulation of the problems is nonsensical—and that is the answer to them.

At the end of his *Tractatus*, Wittgenstein remarked : " The right method of philosophy would be this. To say nothing except what can be said, i.e., the propositions of natural science, i.e., something that has nothing to do with philosophy.

And then always, when someone else wished to say something metaphysical, to demonstrate to him that he had given no meaning to certain signs in his propositions. This method would be unsatisfying to the other—he would not have the feeling that we were teaching him philosophy—but it would be the only strictly correct method."[1]

" What can be said," a significant proposition, is a picture of the facts, which can be compared with the facts, i.e., verified. By " something metaphysical," on the other hand, is meant a combination of words which gives no verifiable picture of the facts.

Wittgenstein says of his book, therefore, in the Preface : " The book will, therefore, *draw a limit to thinking*, or rather—not to thinking, but to the expression of thoughts. For in order to draw a limit to thinking we should have to be able to think both sides of this limit (we should therefore have to be able to think what cannot be thought). *The limit can, therefore, only be drawn in language, and what lies on the other side of the limit will be simply nonsense.*"

2. *Saying and Showing*

When Wittgenstein began to " draw a limit to thinking," however, that is to say, to " what can be said," he made a very important qualification. He drew a distinction between what can be " said," and what can be " shown."

" Propositions," he said, " can represent the whole reality, but they cannot represent what they must have in common with reality in order to be able to represent it—the logical form. . . . Propositions cannot represent the logical form : this mirrors itself in the propositions. That which mirrors itself in language, language cannot represent. That which expresses *itself* in language, *we* cannot express by language. The propositions *show* the logical form of reality. They exhibit it. . . . What *can* be shown *cannot* be said."[2]

This means that when (in philosophical mood) we may want to say " something metaphysical," although we cannot

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 6.53.
[2] Ibid., 4.12.

" say " it, nevertheless it can be " shown." We cannot " say " in significant propositions what is the " ultimate nature " of the " reality " which we picture in our thoughts. But nevertheless, if we understand " the logic of our language," and understand " the limits " of " what can be said," that which we seek vainly in speculative metaphysics will " show itself," although it cannot be " said." " The logical form of reality " cannot be " said," it is " inexpressible " ; but it " shows itself."

This distinction between what is " said " by a proposition, and what is " shown," which is based on Wittgenstein's theory of propositions as pictures of reality, is of very great importance in his philosophy, as will appear more clearly in the sequel. And it is treated by him in a highly mystical fashion. Matter-of-fact and scientific as his philosophical outlook appears to be, it ends up with the claim to some mystical insight into the Real.

What can be " said " are only statements of fact, scientific statements. But : " We feel that even if all possible scientific questions be answered, the problems of life have still not been touched at all. Of course there is then no question left, and just this is the answer. The solution of the problem of life is seen in the vanishing of this problem. (Is not this the reason why men to whom after long doubting the sense of life became clear, could not then say wherein this sense consisted ?) There is indeed the inexpressible. This *shows* itself ; it is the mystical."[1]

I have now to examine Wittgenstein's method of determining what can and what cannot be said, and of drawing a limit to the expression of thoughts ; and to examine also what it is that is shown thereby.

3. *The Principle of Verification*

In Wittgenstein's *Tractatus* the principle or criterion determining what can and what cannot be " said " is developed in two stages. First of all, a proposition to be significant must conform to the laws of logic. And this involves, secondly, that it must be verifiable. A proposition is a picture of the

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 6.54.

facts, and a picture implies some basis for comparison between the picture and that which it pictures. Therefore some method must be conceivable for comparing the picture with the facts.

The logical side is developed at the beginning of the *Tractatus*.

" In logic," said Wittgenstein, " nothing is accidental. If a thing *can* occur in an atomic fact, the possibility of that atomic fact must already be prejudged in the thing. Just as we cannot think of spatial objects at all apart from space, or temporal objects apart from time, so we cannot think of *any* object apart from the possibility of its connection with other things. . . . A spatial object must lie in infinite space. A speck in a visual field need not be red, but it must have a colour ; it has, so to speak, a colour-space around it. A tone must have a pitch, the object of the sense of touch a hardness."[1]

Thus certain terms *can* be combined, because their logical nature, or logical form, permits of the possibility of their combination ; but on the other hand, certain terms *cannot* be combined. And of those that can be combined, while two particular terms may not be combined, they must exist in some combination.

The logical conception involved is a very simple one. For instance, I can significantly say, " This speck is red," and it must have a colour—if not red, then blue or green or yellow, etc. But I cannot significantly say, " This speck is loud," because specks cannot by their logical nature have sounds. Similarly, I can say, " This noise is loud," but not, " This noise is red." " This speck is loud " and " This noise is red," are not false propositions ; they are not propositions at all, but merely insignificant combinations of words—nonsense.

Thus in the first place, the logical nature of the terms we employ is such that certain combinations of them are logically possible, while others are not. Language becomes insignificant when it starts combining terms in a way that contradicts their logical nature.

The logical nature of the terms is here of course *shown* by the laws of logic, or logical rules, which express how the terms may and may not be significantly combined. These laws of logic are *syntactical rules* for the significant use of language.

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 2.01.

But such rules are not arbitrary, because they *show* the logical form of the world.

Thus Wittgenstein would say that " a speck " exists in " a colour space." This means that a speck-word may be significantly combined with a colour-word, but not, for example, with a sound-word. This syntactical rule shows the logical nature of the speck.

Summing up, Wittgenstein stated : " What is thinkable is also possible. We cannot think anything illogical. . . . It used to be said that God could create everything, except what was contrary to the laws of logic. The truth is, we could not *say* of an ' unlogical ' world how it would look. To present in language anything which ' contradicts logic ' is as impossible as in geometry to present by its co-ordinates a figure which contradicts the laws of space, or to give the co-ordinates of a point which does not exist. We could present spatially an atomic fact which contradicted the laws of physics, but not one which contradicted the laws of geometry."[1]

The sense of the example here given will be understood by regarding geometry as " the logic of space," or as " the syntax of spatial language." To speak of a spatial object which contradicted the laws of geometry would then be, not to say something false, but to say something insignificant.

Here, then, is what I have called the first stage of the principle determining what can and what cannot be said. To be significant, a proposition must conform to the laws of logic. The second stage, which introduces the notion of verification, has most far-reaching consequences, but has nowhere been very systematically expounded by Wittgenstein, and must be gleaned from odd remarks scattered through his *Tractatus*.

After the laws of logic, Wittgenstein came to deal with what is necessary in order to *understand* a proposition. Naturally, whatever conforms to the laws of logic can be understood, and whatever can be understood must conform to the laws of logic. Nevertheless, the introduction of the subjective or personal conception of understanding does introduce new features into the criterion of significance.

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[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 3.03.

" To understand a proposition," said Wittgenstein, " means to know what is the case, if it is true."[1]

Elsewhere Wittgenstein had used the expression, " how it would look." Evidently, then, to understand a proposition means that we must be able to imagine " how it would look," " what it would be like," if that proposition were true.

Wittgenstein said further : " In order to discover whether the picture (i.e., the proposition) is true or false, we must compare it with reality."[2]

Piecing such remarks as these together, fairly definite conclusions begin to emerge.

First of all, to understand a proposition we must be able to imagine " how it would look if it were true." If we cannot imagine this, then we cannot understand the proposition. But further, we cannot imagine " how it would look if it were true " unless we can imagine some method to " compare it with reality." If we know " how it would look," then, even if physical limitations prevent us from actually being able to " compare it with reality," we must at all events be able to *imagine some method* to carry out that comparison. In other words, *some method of verification ;* for to verify a proposition means just to " compare it with reality."

If no method of verification is given, then the proposition cannot be understood, that is, it is insignificant. Thus to be significant, a proposition must be verifiable ; it must be capable of some method of verification.

It will now, I think, be seen that the whole of the principle determining what can and what cannot be said is contained in this principle of verification. To give significance to a proposition, we must be able to show how it would be verified. If we cannot show any method to verify what we say, then we are in fact saying nothing. We are putting words together in an insignificant way. We are talking nonsense. This principle of verification contains within itself the principle that what we say must conform to the laws of logic. For very clearly what does not conform to the laws of logic, cannot be verified. As Wittgenstein truly remarked, " We could not say of an ' unlogical ' world, how it would look."

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 4.024.

[2] Ibid., 2.223.

Some examples may help to make clear the scope and application of the principle of verification :

" Parliament is now sitting in London." Method of verification : Travel up to the House of Commons and look in and see. Alternatively : Ring up and ask ; listen to the news on the B.B.C. ; read the parliamentary report in the newspaper.

" Water boils at 100° centigrade." Method of verification : put a thermometer in some water, heat the water, and note the temperature when it boils.

" The positions of the stars determines the course of human affairs." Method of verification : look up the astrological forecasts in back numbers of *The People*, *The News of the World*, *Old Moore's Almanac*, etc., and compare these forecasts with reports of what actually did take place.

" If unequal weights operate at equal distances, the larger weighs down the smaller." Method of verification : carry out experiments with unequal weights.

On the other hand, some " metaphysical " examples may be taken, for which no method of verification can be given.

" The final reason of things must be in a necessary substance . . . and this substance we call God " (Leibniz). There is no method of verification for this statement, we can imagine no method for determining how it would look if this were so, rather than not so. Therefore this statement is meaningless.

" The things perceived by sense have no existence distinct from being perceived " (Berkeley). There is no method of verification for this statement. No method is given for determining how things would " look " different if they existed unperceived from what they would " look " if they had no existence apart from being perceived. Therefore this statement is meaningless.

" Our consciousness is only an image of the external world, and the latter exists independently " (Lenin). There is no method of verification for this statement, which is therefore meaningless, for the same reason as Berkeley's contrary statement was meaningless.

These latter examples (which can be multiplied almost indefinitely by anyone who likes to go through the writings of

philosophers with this end in view) show that, quite in accord with the object " to draw a limit to thinking," Wittgenstein's principle of verification can be used to demolish almost the whole of previous philosophy, whether idealism or materialism, as well as the whole of theology. Wittgenstein's principle of verification is an extraordinarily powerful weapon of criticism. It leaves nothing standing. It " draws a limit to thinking " with a vengeance, and represents practically the whole development of philosophy as nothing but a development of nonsense.

Meanwhile, those who feel drawn to this principle because it seems to uphold science and to demolish theology and idealism, should remember that it also demolishes materialism —and thereby leaves theology and idealism standing exactly where they were, by demolishing their only real opponent. I shall show in the sequel how Wittgenstein's principle leads straight to subjective idealism of the most extreme form, i.e., solipsism.

4. *The Meaning of Propositions and the Method of Verification*

It is now necessary to deal rather more fully with what is in general the method of verification of a proposition, and with some of the conclusions about the meaning of propositions which follow from the general concept of the method of verification.

What is involved in the method of verification ?

Here it is necessary to refer once again to Wittgenstein's logical theory of the nature of propositions and their " pictorial relationship " with facts. The proposition to be verified is " a configuration of signs " to which " corresponds the configuration of objects in the state of affairs." And " in order to discover whether the picture is true or false (i.e., to verify it) we must compare it with reality." Hence the process of verification is a process involving some comparison of a proposition with the facts, or of a configuration of signs with a configuration of objects signified. The method of verification proper to any proposition is the method whereby such a comparison can be made.

But how can such a comparison be made ? Such a comparison can be made when " the facts " or " the reality " of

which the proposition is a picture, are *presented in experience*, in such a way that the correspondence or non-correspondence of the facts and the picture can be perceived. Unless the reality is presented in experience, no comparison can be made. I cannot compare a picture with something which I do not see. *I cannot verify a proposition except by reference to facts presented in my experience.*

To take an example. " The House of Commons is sitting today in London." I verify this proposition by going up to London and looking at them. With what do I compare the picture ? I compare it with my experience, with what I see and hear and (if I am unusually sceptical) touch in my visit to Parliament.

If, while I am carrying out this verification, I hear the voice of some metaphysician—a Communist M.P. perhaps, who is a philosophical materialist—saying, " Of course this Parliament has objective material existence quite independent of experience," I should ignore his words as being altogether unverifiable and meaningless.

Because " experience " is necessarily something private and personal (in philosophical language, " subjective "), the conclusions that follow from this theory of verification would be best expressed in terms of " I " and " my," and not in the usual " we " and " our." For instance, it is clear already that when Wittgenstein said : " In order to discover whether the picture is true or false, *we* must compare it with *reality*," what he means would be better expressed : " In order to discover whether the picture is true or false, *I* must compare it with *my experience*."

Wittgenstein would, however, get out of this by saying that, since no mode of verification can be imagined whereby I should verify a proposition in any other way than in my own experience, and since I cannot imagine experience as anything other than " mine," therefore the expressions " I " and " my experience " used in this context are unnecessary expressions, therefore meaningless, and therefore they might as well be omitted.

In general, the subjectivism and solipsism of Wittgenstein's views is very hard to pin down in discussion, precisely because his theory insists that any philosophical statement of a

subjectivist and solipsist position is as meaningless as any opposing statements of " realism " or materialism. But nevertheless, it " shows itself " even if it " cannot be said," as Wittgenstein himself admits.

Nevertheless, for the sake of clarity, even if at the cost of being accused of using unnecessary signs and of trying to " say " what can only be " shown," I shall continue here to use the words " I," " my " and " mine." The conclusion now reached, then, is that for me to be able to give any meaning to a proposition, I must be able to imagine some possible experience of mine which would verify it—that is, some possible experience of mine such that, if I had that experience, I could compare the proposition with the experience, and say either this experience verifies this proposition or it falsifies it.

Therefore, to understand the *meaning* of a proposition, and to know what possible experience of mine would verify it, are one and the same thing.

The meaning of a proposition is given by its method of verification in (my) experience. What a proposition means is what would be the case if it were true. And what would be the case if it were true is whatever would be the content of my experience if it were true.

What this involves can be roughly elucidated by some more examples.

Example : " Parliament is sitting in London."

Verification, i.e., meaning, of the proposition : Seeing and hearing the Parliamentary debate, following on the chain of experiences which would verify the proposition, " I travel to London and enter the Houses of Parliament."

Metaphysical misinterpretation of the meaning : That the House of Commons has real material existence external to experience, and that real material organisms called Members of Parliament, endowed (some of them) with consciousness and reason, are sitting in it.

Here the " metaphysical " expressions, " real material " and " external to experience " have no meaning. How can I compare the proposition with " real material " facts " external to experience " ?

But the consequences of Wittgenstein's principle of verification are illustrated more strikingly by examples of propositions

(*a*) referring to the past, and (*b*) referring to the experiences of other people.

Example : " Dinosaurs used to live on the earth in the Mesozoic period."

Verification, i.e. meaning : Seeing and touching certain objects, of an appearance which would verify the proposition, " These are fossils " ; verifying that the form of these objects is such that they belong to the class of fossils which paleontologists agree to call fossil remains of dinosaurs ; verifying that the appearance of the strata in which these fossils are found to be embedded is such that they are strata of the sort that geologists agree to call strata deposited in the Mesozoic period.

Metaphysical misinterpretation : The earth had real material existence long before I myself, or any paleontologists or geologists, ever existed or had experiences ; and in the Mesozoic period of the earth's real material history it was inhabited by dinosaurs.

This is unverifiable metaphysical nonsense. For how can I compare the proposition with what took place millions of years ago " outside " my own or anyone else's experience ?

Example : " Mr. Drury has toothache."[1]

Verification, i.e. meaning : Seeing his swollen face ; hearing his groans and complaints ; looking in his mouth and seeing his decayed tooth ; etc.

Metaphysical misinterpretation : Another really existing person, Mr. Drury, has an experience of pain in his tooth, very similar to my own and other peoples' experiences of pain when we have decaying teeth.

This again is unverifiable metaphysical nonsense. For how can I compare the proposition with what takes place in someone else's experience, that is, with something absolutely inaccessible to me ? (It follows, incidentally, that if I say, " I have toothache," and " Mr. Drury has toothache," the verification, and therefore the meaning, of the two propositions is very different. My own toothache I verify by an experience of pain. But if I and Mr. Drury both have toothache, it is metaphysical nonsense to suggest that two similar experiences

[1] This was a popular example once in Wittgenstein's discussions which I attended in Cambridge. If Mr. Drury should read these words, I send him my best wishes and hope he has got over the toothache.

of pain exist : I cannot verify the existence of the second—Mr. Drury's—experience of pain, nor can I compare the two experiences to establish their similarity.)

These examples can be multiplied indefinitely by anyone who finds it instructive or amusing to do so. Their importance is that they " show " what is involved in Wittgenstein's logical principle of verification.

Thus Wittgenstein's criterion for determining the conditions for the significance of propositions, leads to a position of out and out solipsism. I cannot speak, or what is the same thing, think significantly about anything outside the limits of my own experience, my own subjective world. The whole world shrinks into " the narrow compass " of my own immediate present experience, which exists mysteriously on its own, and in the void.

But according to Wittgenstein's principles about " saying " and " showing," this solipsism cannot be *said ;* it is rather *shown* when we understand the principles of " the logic of our language." Hence his solipsism is expressed in a series of cryptic utterances :

" The world is my world."

" What solipsism means is quite correct, only it cannot be said."

" The world of the happy is quite another than that of the unhappy."

" In death the world does not change but ceases."[1]

Here indeed is " a limit " drawn " to thinking." Some might prefer to say that here " thinking " has reached the uttermost limit of absurdity.

5. *The Interpretation of Science*

While Wittgenstein's principle of verification reduces nearly all philosophy to nonsense, in the sense that most " philosophical questions " are nonsense-questions, and the answers given to such questions by philosophers are nonsense, the same principle apparently treats science with the greatest respect. The study of " the logic of our language " rules out of order all " metaphysical propositions," and allows only statements of fact, and scientific statements.

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 5.62, 6.43.431.

Unlike the statements of metaphysicians, scientific statements are verifiable. And therefore while rejecting the " metaphysical " theories of philosophy as meaningless, we are to accept science. Science, in fact, provides the one road towards constructing verifiable, and therefore significant, theories about the world.

But while the principle of verification thus elevates science to the privileged position of comprising the sum-total of human knowledge, it does not leave science alone. It can be applied with considerable rigour to the interpretation of science. Since the meaning of any proposition is given by its mode of verification, the meaning of any scientific generalisation is to be interpreted in terms of the set of experiences by which it is to be verified.

According to this, any scientific theory is to be regarded as simply a shorthand expression for saying that certain sorts of experiences may be expected under certain conditions.

For instance, the Copernican theory is a shorthand expression for saying what I may expect to observe about the position of the sun, moon and stars.

The Darwinian theory of evolution is a shorthand expression for saying what I may expect to observe about species of living organisms.

The modern atomic theory is a shorthand expression for saying what I may expect to observe when I take certain readings off electrical apparatus.

And so on.

The Copernican theory does not say anything about the existence of the sun, moon and stars, apart from what is observed, and outside my own experience. Nor does the theory of evolution say anything about the existence and history of living organisms apart from what is observed, and outside my own experience. Nor does the atomic theory say anything about the constitution of matter, existing objectively and outside anyone's experience.

All such scientific theories are based on the experiences of past observations, and are elaborated from these according to very complicated linguistic rules. Should future experiences not correspond with what a scientific theory says is to be expected, then the theory has to be altered.

From this analysis is deduced also the famous " Principle of Occam's Razor " or " Principle of Economy," which says : " Entities must not be multiplied beyond necessity."

A theory which deals with, say, two entities, a and b, thus :

$$f(a, b),$$

and a theory which deals with, say four, a, b, c and d :

$$f(a, b, c, d),$$

can both mean exactly the same thing, if each gives the same rules for the expectation of future experiences. But in that case, the first is preferable to the second, because it is the simpler mode of expression. And moreover, since the extra expressions, " c " and " d " are *unnecessary* in the symbolism expressing the rule, they are in fact *meaningless* symbols. For if " f (a, b, c, d) " has exactly the same verification as " f (a, b)," how can we verify that " c " and " d " exist, rather than do not exist ? Thus Wittgenstein states : " If a sign is not necessary, then it is meaningless. That is the meaning of Occam's Razor."[1]

For instance, take Maxwell's equations for the electromagnetic field. It was common in the 19th century to try to invent all manner of complicated " mechanical models " to explain the phenomena of electricity and magnetism. But the observed facts could be described just as well in terms of Maxwell's equations without the mechanical models ; all the mechanical hypotheses were unnecessary, and therefore meaningless.

Again, the Ptolomaic and Copernican theories, in so far as each expresses the observed facts, mean the same. But the Copernican theory is the simpler ; and all the epicycles and other complicated hypotheses of the Ptolomaic theory are meaningless, because unnecessary. It is not a matter at all of trying to find out the real motions of the heavenly bodies relative to one another—for that is metaphysics ; it is a matter of describing certain parts of our experience.

Again, in the 17th century Newton propounded a corpuscular theory of light, according to which light consisted of a stream of corpuscles, while Huygens maintained that light consisted of waves. Both theories described all the observed facts, and

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 3.328.

so there was nothing to choose between them ; the controversy as to whether light " really " consisted of corpuscles or waves was meaningless. Later on, when the interference phenomena of light were observed, these observations were described most simply by the wave theory ; and so that theory was preferred.

6. *Where has Wittgenstein led us ?*

In now examining the results of Wittgenstein's philosophy (as distinct from the peculiar method and premises that led to those results), one cannot but be struck by the fact that there is nothing new in them. The upshot of the whole of Wittgenstein's theorising is but to lead back again to the old subjectivism of Berkeley.

The parallel between Wittgenstein and Berkeley is indeed a very close one. In the intervening two hundred years, this type of philosophy has advanced no further than to find new-fangled ways of saying the same thing.

Berkeley said that the world I perceive has no existence apart from my own perceptions. Wittgenstein says that propositions have no meaning apart from their verification in my own experience, and that " the world is my world."

Berkeley said that to talk of material substance existing external to experience was to use words without attaching any meaning to them. Wittgenstein says the same.

In order to try to provide some why and wherefore for human experience detached from all material existence, Berkeley called in the aid of God. Wittgenstein, at the end of his *Tractatus*, has resort to " the mystical " for the same purpose.

Finally, both philosophies have much the same kind of internal inconsistency.

This inconsistency showed itself in Berkeley when, after insisting on the impossibility of non-empirical ideas, he began to introduce " notions " of God, the Soul, Causality, and whatever else suited him, and distinguished " notions," with non-empirical content, from empirical " ideas."

In the case of Wittgenstein, it is equally easy to see that nearly all the philosophical " propositions " of his *Tractatus Logico-Philosophicus* sin against his own principle of verifiability, and should therefore be, on his own showing, meaningless.

Like Berkeley with his " notions," Wittgenstein tries to get round this difficulty by maintaining that philosophical truths " show themselves," though they cannot be " said." But this does not alter the fact that he has said them.

" My propositions are elucidatory in this way," said Wittgenstein, at the end of his *Tractatus*. " He who understands me finally recognises them as senseless, when he has climbed out through them, on them, over them. He must so to speak throw away the ladder, after he has climbed up on it."[1]

This is only an admission of the complete internal inconsistency of the whole philosophy. (To look ahead for a moment, just as Hume tried to eliminate the inconsistency of Berkeley, so I shall presently show how Carnap has tried to eliminate the inconsistency of Wittgenstein. Thus does history repeat itself; and moreover, " on the second occasion, as farce.")

Wittgenstein's teachings are, then, only a repetition of the teachings of Berkeley. There are new words, a great many principles about " the logic of our language ; " but what we conclude from it all is exactly the same.

It is in relation to the interpretation of science that this philosophy finds its point and importance, now as in the past. Does science provide knowledge of things outside us, of the objective material world existing prior to and independent of all experience or other spiritual or mental activity? This philosophy answers, no. Science refers only to the subjective contents of experience. This philosophy continues to interpret or to analyse scientific truth philosophically, as dealing merely with sequences of perceptions, not with the constitution and laws of the objective world.

In relation to the " new method " of logical analysis, the outcome of Wittgenstein's " logical analysis of language " was definitely to tie down the interpretation or analysis of propositions within the limits of Berkeleyan subjective idealism. There was after all something very faintly materialist about the efforts of Moore or Wisdom to find " the analysis " of propositions which would reveal the ultimate objects to which those propositions referred. Evidently they thought there

[1] Wittgenstein: *Tractatus Logico-Philosophicus*, 6.54.

might be an objective material world, even though they tried to find out about it by metaphysical speculation instead of by scientific investigation. But by means of the principle of verification, Wittgenstein has rigidly insisted that every " analysis " shall be in terms of the contents of sense experience. The meaning of a proposition is its mode of verification. Any proposition, whether it is a simple statement of fact or a proposition of science, means only something about experience. For no sense can be given to saying anything that refers to objects outside experience and external to consciousness.

Thus it is only a continuation still of the old story of the disarming of science, and the denial of scientific knowledge of the objective material world.

But evidently science is hard to disarm, for the method of disarming it has become, with Wittgenstein, extremely tricky and subtle. This trickiness and subtlety it is very important to understand. What Berkeley meant is very easy to understand—but what Wittgenstein means, very difficult. And so people can very easily be deceived. For they accept such a dogma as the principle of verification, without understanding what it means.

I referred above to the fact that, while the principle of verification very clearly means that the meaning of any proposition is given in the mode of verification in my own experience, yet Wittgenstein would not allow that such an expression as " in my own experience " should be used. Why not? Because—what else can a proposition mean? There is no sense in saying that I verify a proposition outside my experience, or in someone else's experience ; and so there is no sense in saying that I verify it *in my* experience. The expression " in my own experience " is not necessary, and therefore it is meaningless. For " if a sign is not necessary, then it is meaningless."

Thus while Wittgenstein's logical principles very clearly do limit the meaning or interpretation of all propositions to their mode of verification in my experience, and so will not allow it to be significant to refer in any way to objective material things external to consciousness, but restrict our knowledge within " the narrow compass " of a mysterious subjective world ; yet the same logical principles expressly forbid us to

say that this is so. To say so is unnecessary, and therefore meaningless.

As Wittgenstein remarked : " He who understands me . . . must so to speak throw away the ladder after he has climbed up on it." I think a more apt injunction would be, that he must cover up all traces of the crime after he has committed it. For objective truth has been foully murdered, and subjectivism installed in its place ; but the murder and the substitution must be covered up. This is done by erasing all statements which point to them.

But this procedure, while it sometimes completely takes in people who have adopted a standpoint, so to speak, inside the circle of Wittgenstein's ideas, cannot deceive those who stand outside that circle. And as evidence there is always Wittgenstein's own statement at the end of the *Tractatus :* " What solipsism (and subjectivism) means is correct, only it cannot be said." While his subjective idealism " cannot be said," it nevertheless does very clearly " show itself."

7. *A Philosophy divorced from life*

The most obvious, but at the same time most profound and most complete, criticism of the philosophy of Wittgenstein, is, that it leads to consequences which are manifestly absurd.

This absurdity is summed up in one word—solipsism.

It is clearest in relation to the account given of propositions about the past, and propositions about other people.

In the realm of the interpretation of science, the absurdity may not appear so manifest. For example, we read about photons and electrons, etc., and we suppose that this applies to the constitution of the material world outside our own consciousness. But Wittgenstein says, no—these terms are rather ways of describing certain aspects of our own experience, and to try to apply them to a " real " " external " material world leads to metaphysical nonsense. This may seem arguable so long as the precise meaning of such terms as " photon " or " electron " is left obscure.

But now let us speak in more familiar terms, about the feelings and experiences of other people with whom we come in contact, and about events that took place in the past. Again we are told that these terms too are only ways of

describing our own experience, and that to think they apply to really existing other people with consciousness and feelings like our own, or to a past that really took place, is likewise metaphysical nonsense. But this can be recognised by anyone as an absurdity.

" The world is my world." " What solipsism means is correct." These statements are absurd.

To say that Wittgenstein's philosophy and its consequences are absurd, is less a criticism of pure theory, than a practical social criticism.

It is not an argument of " *reductio ad absurdum*," as understood in the logical text-books. Such an argument consists in showing that a certain proposition is false, because it implies conclusions which contradict other propositions which are either axiomatic or have already been proved. No such logical criticism is here made of Wittgenstein's philosophy.

To put forward and expound a philosophy is an activity, a social activity. And to put forward a solipsist philosophy is an absurd activity. That is the point. It is absurd, just as it would be absurd to walk about naked and say you were living in the Garden of Eden, or to sit down all day in your allotment and say you were a cabbage. The point of view of the latter persons may be perfectly self-consistent ; but it is not consistent with the facts of their social life. Similarly, a solipsist philosophy may be perfectly self-consistent ; but it is not consistent with the conditions of the social life of mankind. We live in society, we take part in affairs, we are born, grow up, reach maturity, and die—for anyone to invent a solipsist philosophy is absurd.

Thus this solipsist philosophy is characterised by the fact that it is completely divorced from life. Our conditions of social life and our relationships with the world about us, set us many problems, some of which are being solved and others await solution ; a solipsist philosophy merely separates itself entirely from the problems of life.

Wittgenstein too spoke about " the problem of life." In fact, he claimed to solve it. " The solution of the problem of life," he wrote, " is seen in the vanishing of this problem."[1] Of course it will " vanish," if you shut your eyes and dream ;

[1] Wittgenstein : *Tractatus Logico-Philosophicus*, 6.521.

but it is there just the same, only you have cut yourself off from it.

However, what of Wittgenstein's arguments about Verification? Is he not simply saying that we should say nothing that cannot be verified, and that what is unverifiable is meaningless? What is there absurd about that?

There is nothing absurd in saying that what we say should be verifiable. But the way in which Wittgenstein approaches the question of verification illustrates the way in which his whole theoretical outlook is divorced from life. His account of verification is obviously an incorrect account, because the consequences to which it leads are absurd.

Let us then set on one side the theory that a proposition is a picture of the facts, and that we verify it by comparing it with the facts which it pictures—and make a different approach, not from the basis of a logical theory, but in the light of the plain facts of everyday and scientific experience.

What is verification?

Without going into any detail about the theory of scientific method, it may be said, in the first place, that verification is *a practical activity;* that is, it involves some interaction between a person and his environment, in which he consciously alters his environment in some way. When any proposition is verified, and is put to the test of experience, the method of verification always involves that the person who is verifying the proposition performs some action, or series of actions, in which he arranges and alters things, in a manner to test the truth or falsity of the proposition he is interested in.

We verify our ideas about the world—i.e., propositions—not by contemplation, but by action. We verify whether our ideas about the world are right or wrong by changing the world in accordance with our ideas of it.

A proposition is not, then, verified through a sequence of events in "pure experience," but by a sequence of actions; and action, of course, leads to experience.

For instance—"There is coal in the coal-scuttle": how do I verify this? I verify it first of all by looking, but further by picking up whatever is in the scuttle, breaking some of it up, putting it on the fire, etc., in order to tell whether it really answers to the description of coal.

Verification is, then, in the first place a practical activity.

In the second place, the method of verification is usually, and always in the case of scientific verification, *a co-operative social activity,* involving the practical co-operation of a number of people.

Very often an individual person can verify his own ideas for himself. This is in general the case with ideas about very familiar objects—for instance : that there is coal in the coal scuttle, that Mrs. Brown lives at No. 32, that it's raining today, and so on. But that is only because we each have at our command a great deal of socially accumulated experience and knowledge, which makes us immediately able to recognise familiar objects and their properties when we see them. In certain cases we might well desire the collaboration of others in verifying our ideas.

The social character of the method of verification is most evident in science. The verification of a proposition of science is always social, and must be—partly because the observations of one observer will never be accepted unless they are checked by the observations of others ; and also because the verification of many propositions of science is such that one observer could not possibly verify them, and the method of verification must necessarily be a social method, carried out co-operatively by several observers.

For example, one consequence of Einstein's theory about gravitation is that a ray of light passing at a distance, r, from the centre of the sun will be deflected by an amount $\frac{4m}{r}$, where m is the gravitational mass of the sun. According to the previously accepted Newtonian theory, the deflection would be $\frac{2m}{r}$. What is the method of verification to tell which theory is right, Einstein's or Newton's ?[1]

The method is to take photographs of a star so situated in relation to the earth and the sun that light coming from it passes very close to the sun on its way to the camera. Such photographs can only be taken during a solar eclipse, and the position of the point of light on the photograph will enable the amount of the deflection to be calculated.

[1] See Eddington : *Space, Time and Gravitation,* chs. 6 and 7.

This method of verification was undertaken by six astronomers during the solar eclipse in May, 1919. Three of them went with two telescopes to Brazil, and three went with another to the Gulf of Guinea ; and their apparatus was prepared and tested before they set out by a Joint Committee of the Royal Society and the Royal Astronomical Society. The process of taking the photographs was a difficult and elaborate one, and each of the three observers at each observation point was busy with a different job during the making of the observations. When they got home, measurements were made of all the photographs which had been taken—and the result was that Einstein's prediction was verified.

This is an example of the social character of scientific method, and that the method of verification is a co-operative social activity. In this case it involved a Joint Committee plus six astronomers, two journeys half across the world and back, the setting up of elaborate telescopes, the taking of photographs, the development of the plates, the measurement of the position of points of light appearing on the plates, and so on.

Verification is, then, a practical activity, usually carried on by a number of people in co-operation ; and in that case verification is not carried out by any one of them, but is the social result of their joint activity.

Taking into account, therefore, that verification is a practical activity, carried out co-operatively by socially organised people—what conclusion is presented ? The conclusion is presented that verification is concerned with testing our knowledge of the objects and properties of the objective material world ; objective and material in the sense that all people live in and know the same world, to which their particular experiences relate and in which their activities are carried on.

In any case, what is there in the method of verification to suggest the conclusions that Wittgenstein draws, namely, that the meaning of a proposition is its mode of verification in experience, and that " the world is my world " ? The principle of verification—that all propositions must be verifiable—gives in fact no support to Wittgenstein's views.

On the contrary, far from the principle of verification giving support to Wittgenstein, the nature of the process of verification seems altogether incompatible with his views.

For if verification is a practical activity, carried out co-operatively by several different people, how can verification be the work of one person in a solipsistic world of his own? It is the social work of many people, who live in a common world.

If verification is an activity in which we bring about changes in the world in order to test the correspondence of our ideas with the world, how can verification be a process confined to one person's subjective experience? Verification is not "a comparison" of a proposition with "facts" which turn up in my experience. It is a testing of the correspondence of the proposition with objective facts, a testing which can only be carried out in the practical activity of changing the world.

If I say Parliament is sitting in London, I mean it is sitting in London whether I go there to listen or not.

If I say dinosaurs used to walk the earth, I mean that they used to exist, whether I dig up their fossils or not.

If I say my friend has toothache, I mean he suffers pain, even though I cannot feel it myself.

If I say that light is deflected by gravitational attraction according to the formula $\frac{4m}{r}$, I mean that that is how it travels through space, not merely that certain dots on a photographic plate will occupy certain positions rather than others.

It is now not very hard to see how Wittgenstein has twisted and falsified the principle of verification.

He has been guilty of exactly the same muddle as all other pure empiricists—the muddle which was analysed in Chapter 6. They all regard knowledge as built up by some hypothetical atomic individual, on the basis of his own sensations; whereas in fact knowledge is the social product of the co-operative social practice of many individuals, who act upon and are acted upon by material objects which are independent of their own existence and consciousness.

Wittgenstein seems to regard verification as a process carried on by some hypothetical atomic individual consciousness, which has its own "world," which "ceases" with its death; and in verification propositions are simply "compared" with "facts" which turn up in the private "world" of pure experience.

But this is a completely false account of the process of verification. It leaves out the two most essential features of verification—that it is practical and that it is social. When we reflect upon the practical and social character of the method of verification, then we see that to use verification as an argument for subjectivism and solipsism is indeed utterly absurd.

What is the importance of verification in the system of human thought?

Its importance is not that by showing how a proposition can be verified we show what it *means*. Its importance is that by showing how a proposition can be verified we show how it can be ***known***. Verification is not a test or definition of meaning, but is a far more important test, namely, a test of knowledge. Verification is the test whereby we can tell that our thoughts are not mere idle speculations, but constitute, if only partially and approximately, knowledge of the objective world.

It is only an introspective and contemplative philosophy which concerns itself primarily with the criticism of the meaning of thoughts. For the advancement of human life, what is important is that the system of our ideas should be based on knowledge. And for the advancement of knowledge, what cannot be verified is of no use or value whatever. A proposition or a theory for which no method of verification is put forward is at best only a guess or speculation. The great value of science is that it is a method for formulating theories which can be verified, that is, for constructing a body of knowledge. For as Bacon said, "Knowledge of nature is the same thing as power over nature."

It may be thought perhaps that Wittgenstein's insistence on the principle of verification bears a close relationship to some of the fundamental ideas of materialism. Did not Bacon, the founder of modern materialism, start from the standpoint that whatever we can claim to know must be capable of verification?

But Wittgenstein's approach is a different one. Bacon started with the object of seeking for the indefinite expansion of our knowledge of the objective world; and pointed out that the criterion of such knowledge is that it is verifiable, as

distinct from the unverifiable dogmas of narrow scholastic philosophy. But Wittgenstein started with an entirely different object. His object was to " draw a limit to thinking." He did not take as his starting point the objective world and our expanding knowledge about it and power to change it ; but he took as his starting point an introspective criticism of the process of thinking, with a view to " limiting " that process. Thus these philosophies are poles asunder.

It may perhaps be said that Wittgenstein's philosophy has at all events the outstanding merit of insisting on our giving a method of verification for all propositions. But where is the merit? This standpoint has been insisted upon and developed by materialist philosophy for the past three hundred years. Wittgenstein's alleged merit consists only in his having introduced confusions into the conception of the method of verification, and having systematised these confusions into a rigid system of " logical philosophy." But this is a merit only from the point of view of those who are interested in introducing confusions into our conception of the sciences ; but such a point of view has its roots deep in the character of class society today, as in days gone by.

The outstanding characteristic of Wittgenstein's philosophy is, first, that it represents a system of introspective scholastic theorising, altogether divorced from life and from the realities of our practical social existence. Second, the aim of this philosophy, " to draw a limit to thinking," can correspond only with the aims of those who are interested " to draw a limit " to thinking out the implications of scientific knowledge —as knowledge of the objective world, and therefore as power over nature, pointing to the need for a social organisation to enable that power to be used for the purposes of social progress. Third, this philosophy, divorced from life as it is, is nevertheless a part of life—a social force, but one serving in the main the purposes of the reactionary classes in their struggle against materialist enlightenment.

CHAPTER 10

LOGICAL POSITIVISM (1)

1. *Philosophy as the Logical Syntax of the Language of Science*

I NOW come to the latest and, it is to be hoped, last stage in the development of modern empirical philosophy—the special and peculiar doctrines of Carnap and his " circle."

This " circle " was closely organised before the war, though the impact of the war broke it up, temporarily at all events. Their real fountain-head and progenitor was Wittgenstein ; but Carnap had several (to them) very important differences from Wittgenstein, and indeed from all other empirical philosophers.

The main difference was that Carnap insisted on excluding from philosophy all references to *meanings*, and to *the relations of thoughts with things*. Such references, he thought, led straight to confusion and nonsense, and philosophy should confine itself absolutely exclusively to a programme of the logical analysis *of language*.

Such a programme had already been enunciated by Wittgenstein. But Wittgenstein, by allowing himself to become entangled in meanings, had not carried out the programme with full consistency. The downfall of Wittgenstein's philosophy was its solipsism. Carnap thought that this solipsism could be avoided by rigidly excluding from philosophical discussion any reference to the meaning of statements, and confining philosophy to the study, not of meaning, but of syntax.

Carnap speaks of " the problems of applied logic, of the logic of science, i.e., the logical analysis of the terms, statements, theories proper to the various departments of science. . . ."[1] " In this fashion," he explains, " we use logical analysis to investigate statements of the various kinds proper to the various departments of science."[2]

[1] Carnap : *Unity of Science*.

[2] Ibid.

Thus the basis of Carnap's position is that science is accepted as the vehicle of knowledge about the world, its constitution and laws ; and the task of philosophy is to subject science to logical analysis. This is nothing new. But Carnap goes on to rigidly insist :

" A philosophical, i.e., a logical, investigation must be *an analysis of language*."[1]

And again : " Philosophy is to be replaced by the logic of science—that is to say, by the logical analysis of the concepts and sentences of the sciences ; for the logic of science is nothing else than *the logical syntax of the language of science*."[2]

Thus Carnap maintains that logical analysis, and the logical analysis of science in particular, is not concerned, as his predecessors thought, with analysing the *meaning* of terms and exhibiting the ultimate logical nature of the facts and laws established by science (e.g., that they are facts and laws concerning the order of events in experience) ; but is concerned with analysing *the language* of science, and exhibiting what he calls " the logical syntax " of that language.

This is the standpoint, so Carnap thinks, which finally purges philosophy, that is, logical analysis, from all confusion, speculation and " metaphysics."

2. *Object-questions and Logical-questions : Formal Theories and the Principle of Tolerance*

" The questions dealt with in any theoretical field," says Carnap, " . . . can be roughly divided into *object-questions* and *logical-questions*. . . . By object-questions are to be understood those which have to do with the objects of the domain under consideration, such as inquiries regarding their properties and relations. The logical questions, on the other hand, do not refer directly to the objects, but to sentences, terms, theories, and so on, which themselves refer to objects."[3]

Thus science deals with objects. But philosophy, that is the logical analysis of science, does not deal with objects at all, but with " sentences, terms, theories, and so on "—in a word, with *language*.

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[1] Carnap : *Unity of Science*.
[2] Carnap : *Logical Syntax*, p. xiii.
[3] Ibid., p. 277.

Thus it appears that Russell and Wittgenstein should not have spoken of objects and facts, of the meaning of propositions, and of the comparison of propositions with reality. All that led them into " metaphysics." It is wrong to try to say anything of the relations of propositions and *facts*, of thought and *reality*. Scientific philosophy must confine its discourse to the relations of propositions with *propositions*, of thoughts with *thoughts*, and will deal exclusively with " the logic of language." (Thus incidentally, the materialist criticism of Wittgenstein's ideas about verification which I gave in the last chapter, would appear to be entirely the wrong criticism : the right criticism would be to criticise Wittgenstein for attempting to say anything at all about the comparison of propositions with facts, for nothing should be said upon such a subject.)

It is clear that this standpoint means that Carnap and his " circle " takes a rather different view of logic from that expounded by Russell and Wittgenstein. And since the account given of pure formal logic must stand at the base of the " applied logic " or " logic of science," I must briefly direct attention to it before proceeding any further.

According to Carnap, " logic is syntax."[1] And he explains : " By the logical syntax of a language, we mean the formal theory of the linguistic forms of that language—the systematic statement of the formal rules which govern it, together with the development of the consequences which follow from these rules."[2]

He goes on to explain what he means by a " formal theory."

" A theory, a rule, a definition, or the like is to be called formal when no reference is made in it either to the meaning of the symbols (for example, the words) or to the sense of the expressions (e.g., the sentences), but simply and solely to the kinds and order of the symbols from which the expressions are constructed."[3]

Formal logic, or " logical syntax," is, then, concerned " simply and solely " with symbols, or with language, without regard to meaning.

This means that " logical syntax " is " the system which

[1] Carnap : *Logical Syntax*, p. 259.
[2] Ibid., p. 1.
[3] Ibid., p. 1.

comprises the rules of formation and transformation " of a language.

Every language, considered formally (in the above sense of " formal," that is, without regard to its meaning), is based on " rules of formation and transformation."

The rules of formation show how symbols may be combined together to form sentences. The rules of transformation show how sentences may be obtained from other sentences.

Thus if we know the rules of formation, then that corresponds to knowing which sentences are significant and which insignificant : and from a formal point of view, significant just means allowed in that language, and insignificant means not allowed. And if we know the rules of transformation, then that corresponds to knowing which sentences can be validly deduced or follow from which other sentences, and which do not follow from or are contradictory to which other sentences. From a formal point of view, that " p " follows from " q " means that if you say " q " you are allowed by the rules of the language to say " p," but not to say " not-p."

Hence whether a sentence is significant or insignificant, and whether a sentence follows from another or does not follow from it or is contradictory to it, does not depend at all on the *meaning* of the sentences, but can be seen solely from their syntactical form, given a knowledge of the rules of formation and transformation of the language.

This " corrects " the usually accepted opinions of logicians.

" The prevalent opinion," says Carnap, " is that syntax and logic, in spite of some points of contact between them, are fundamentally theories of a very different type. The syntax of a language is supposed to lay down rules according to which the linguistic structures (e.g., the sentences) are to be built up from the elements (such as words or parts of words). The chief task of logic, on the other hand, is supposed to be that of formulating rules according to which judgments may be inferred from other judgments ; in other words, according to which conclusions may be drawn from premises." And he continues : " Even those modern logicians who agree with us in our opinion that logic is concerned with sentences, are yet for the most part convinced that logic is equally concerned with the relations of meaning between sentences. They

consider that, in contrast with the rules of syntax, the rules of logic are non-formal,"[1] that is, have reference to meanings.

But all this is wrong. The principles of logic can be, and should be, formulated without any reference at all to the meaning of words. They should be formulated simply as syntactical rules of formation and transformation.

But, it will be objected, how do we know which are the *right* rules of formation and transformation? Only by knowing the meaning of the sentences.

Carnap answers this objection. It arises, he explains, from the prejudice that the principles of logic must " constitute a faithful rendering of the ' true logic.' "[2] But the idea that there exists " the true logic "—the eternally valid principles of logic—which any system of logic must contrive to mirror (or to " show," in Wittgenstein's expression), is a mere " metaphysical " illusion.

" We have in every respect," Carnap writes, " complete liberty with regard to the forms of language ; both the rules for construction of sentences and the rules of transformation (the latter are usually designated as ' postulates ' and ' rules of inference ') may be chosen quite arbitrarily. Up to now, in constructing a language, the procedure has usually been, first to assign a meaning to the fundamental mathematico-logical symbols, and then to consider what sentences and inferences are seen to be logically correct in accordance with this meaning. Since the assignment of the meaning is expressed in words and is, in consequence, inexact, no conclusion arrived at in this way can very well be otherwise than inexact and ambiguous. The connection will only become clear when approached from the opposite direction: let any postulates and any rules of inference be chosen arbitrarily ; then this choice, whatever it may be, will determine what meaning is to be assigned to the fundamental logical symbols."[3]

This standpoint is called by Carnap " the principle of tolerance."[4]

" The first attempts to cast the ship of logic off from the

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[1] Carnap : *Logical Syntax*, p. 1.
[2] Ibid.
[3] Ibid., p. xv.
[4] Ibid. pp. xv and 51.

terra firma of the classical forms were certainly bold ones," writes Carnap, referring to the various modern systems of symbolic logic. " But they were hampered by the striving after correctness," that is, by the prejudice that they must " constitute a faithful rendering of ' the true logic.' " " Now, however, that impediment has been overcome, and before us lies the boundless ocean of unlimited possibilities."[1] —" Unlimited possibilities " of " arbitrarily " inventing all sorts of " languages."

Explaining his own method of developing the principles of logical syntax, Carnap writes : " In consequence of the unsystematic and logically imperfect structure of the natural word-languages (such as German or Latin), the statement of their formal rules of formation and transformation would be so complicated that it would be hardly feasible in practice." And so : " Owing to the deficiencies of the word-languages, the logical syntax of a language of this kind will not be developed, but, instead we shall consider the syntax of two artificially constructed symbolic languages (that is to say, such languages as employ formal symbols instead of words)."[2] On this basis he is then able to formulate certain principles of " general syntax," applicable to any language whatsoever.

Such is the programme and standpoint of Carnap and his " circle " in the domain of logic.

Referring back to the logical theories of Russell and Wittgenstein, it will be seen that Carnap's standpoint makes short work of the system of " metaphysics " which they erected on the basis of logic.

Believing that logic must refer to the meaning of words and sentences, and that there must be certain absolute and ultimate logical forms of propositions which mirror the ultimate and absolute logical form of reality, Russell and Wittgenstein were led to consider the relations of propositions and facts, and to speak of " atomic facts," " simple objects," " elements," and the like.

Carnap will have none of this. For him, it is all " metaphysics " and quite inadmissible.

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[1] Carnap : *Logical Syntax*, p. xv.

[2] Ibid., pp. 2, 3.

Logical analysis is not concerned with meanings, and with exhibiting the logical form of reality. It is concerned with the syntax of language. So the logical analysis of science likewise is not concerned with making clear the ultimate meaning and justification of science, but with making clear the syntactical principles according to which scientific statements are constructed, and the relations of such statements one to another.

The next step is the application of these logical principles to the problems of philosophy, that is, to " the problems of applied logic, the logic of science."

3. *The Formal and Material Modes of Speech*

In dealing with the logical analysis of science, Carnap distinguishes two " modes of speech " in which the results of this analysis may be expressed. The first he calls " the material mode of speech," the second, " the formal mode of speech."

" The first speaks of objects, states of affairs, of the sense, content and meaning of words ; while the second refers only to linguistic forms."

Clearly, the material mode is " the more usual mode of speech." But the formal mode is nevertheless " the correct mode of speaking."[1]

In his book, *Logical Syntax*, Carnap gives some examples of the material and formal modes of speech in philosophy. In these examples the same philosophical proposition is expressed in both modes of speech :

" *Material Mode*	*Formal Mode*
A thing is a complex of sense data.	Every sentence in which a thing-designation occurs is equipollent to a class of sentences in which no thing-designations but sense-data designations occur.

[1] Carnap : *Unity of Science.*

" *Material Mode*	*Formal Mode*
A thing is a complex of atoms.	Every sentence in which a thing-designation occurs is equipollent to a sentence in which space-time co-ordinates and certain descriptive functors (of physics) occur.
The world is the totality of facts, not of things.	Science is a system of sentences, not of names.
A fact is a combination of objects (entities, things).	A sentence is a series of symbols.
Time is infinite in both directions, forwards and backwards.	Every positive and negative real number expression can be used as a time co-ordinate."[1]

These examples are evidently intended to show how philosophical sentences in the material mode can be translated into the formal mode ; and how moreover the material mode is apt to be misleading, whereas the formal mode is clear and " correct."

For the above sentences in the material mode sound as if they were asserting some property of the objective world—namely, important philosophical properties of things, the world, facts, and time. But when translated into the formal mode, it is clear that they are really only syntactical assertions, that is, not assertions about objects but about words.

Thus philosophical propositions are not really concerned, as philosophers usually believe, with making clear " the nature " or properties of things, the world, facts, time, etc., etc. ; but they are syntactical propositions, about words, not about objects. And that this is so will be made clear by using " the correct formal mode of speech."

" Accordingly," says Carnap, " we distinguish three kinds of sentences : 1. Object-sentences. 2. Pseudo-object sentences. 3. Syntactical sentences."[2]

[1] Carnap : *Logical Syntax*, pp. 301–307.

[2] Ibid., p. 286.

The sentences of science are object-sentences. To use the material mode, they are about the properties of objects : but as we should not use the material mode at all, we must not say so. On the other hand, philosophical sentences of the analysis of science are pseudo-object sentences, when they are expressed in the material mode. Thus they seem to be " about objects " ; but if they are significant at all, then they are " equipollent " to syntactical sentences, that is, sentences in the formal mode.

" The use of the material mode," Carnap explains, " leads to questions whose discussion ends in contradiction and insoluble difficulties. The contradictions however disappear immediately we restrict ourselves to the correct formal mode of speech. The questions of the kinds of facts and objects referred to by the various languages are revealed as pseudo-questions."[1]

Carnap gives various examples of the difficulties and misleading controversies which arise from the unwise use of the material mode of speech. For instance, arising out of the first two assertions given in the list quoted above :

" Suppose that a positivist maintains the thesis, ' A thing is a complex of sense-data,' and a realist the thesis, ' A thing is a complex of atoms.' Then an endless dispute will arise over the pseudo-question of what a thing actually is. If we transfer to the formal mode of speech it is in this case possible to reconcile the two theses. . . . For the various possibilities of translating a thing-sentence into an equipollent syntactical sentence are obviously not incompatible with one another. The controversy between positivism and realism is an idle dispute about pseudo-theses, which owes its origin entirely to the use of the material mode of speech."[2]

" For complete safety," Carnap concludes, meaning safety from " idle disputes about pseudo-theses," " it would be better to avoid the use of the material mode entirely. . . . If this mode is still to be used, particular care must be taken that the statements expressed are such as might also be expressed in the formal mode. That is the criterion which distinguishes statements from pseudo-statements in philosophy."[3]

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[1] Carnap : *Unity of Science.*

[2] Carnap : *Logical Syntax*, p. 301.

[3] Ibid.

4. *The Logic of Science*

Having established this distinction between the material and formal mode of speech, the next business is " the logic of science," in which care must be taken to speak in " the correct formal mode " throughout, or, if we do use the material mode, to make sure that what is said in the material mode can be translated into the formal mode.

Speaking of science in general, Carnap says : " Science is a system of statements based on direct experience and controlled by experimental verification. . . . Verification is based on protocol statements."[1]

This generalisation must be interpreted carefully, because the references to " direct experience " and " experimental verification " savour strongly of the material mode of speech. In formal strictness and purity, Carnap does not analyse science as " based on experience," but investigates science as " a scientific language," or set of " scientific languages " (corresponding to the different sciences). He is concerned with science as " a system of statements " ; and the important feature of science, he alleges, is that its statements are based on " protocol statements."

What then are protocol statements ? Carnap proceeds to explain :

" The simplest statements in the protocol language refer to the given, and describe directly given experiences or phenomena, i.e., the simplest states of which knowledge can be had."[2]

This, however, is expressed in the material mode. Here is the same explanation in the formal mode :

" The simplest statements in the protocol language are protocol statements, i.e., statements needing no justification and serving as foundations for all the remaining statements of science."[3]

The programme of the logical analysis of science is, then, of a strictly formal syntactical nature. It aims to show how

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[1] Carnap : *Unity of Science.*

[2] Ibid.

[3] Ibid.

science, the whole system of scientific statements, is derived from protocol statements according to certain formal rules.

Obviously these rules must in actual scientific practice be enormously complicated. However, the sort of thing meant can be made clear by an elementary example :

Suppose we are concerned with two pointer-readings, x and y, and our aim is to formulate a scientific generalisation showing how y depends on x. The readings will then be our protocol. Suppose, then, that we have the following protocol statements :

$x=1$	$y=2$
$x=2$	$y=4$
$x=3$	$y=6$
$x=4$	$y=8$

Then from this protocol we may derive the following generalisation, or scientific statement :

$$y = 2\ (x).$$

This part of the procedure corresponds to that aspect of science described by Carnap in saying that its statements are " based on direct experience." That is, it shows how scientific statements are first derived from protocols. But the scientific statements are further " controlled by experimental verification." That is, having been derived from the protocol, they have further to be controlled, tested, revised, in relation to the protocol.

Let us therefore take some more readings. If the generalisation continues to fit the protocols, well and good, the generalisation stands. But suppose we now find that it no longer fits the protocols ? Then in that case the generalisation has to be revised, and another made which does fit the protocols.

For instance, suppose that on taking the readings a second time we have the protocols :

$x=1$	$y=4$
$x=2$	$y=8$
$x=3$	$y=12$
$x=4$	$y=16$

Then our former generalisation must be scrapped. But a new simple generalisation, namely : $y = 4\ (x)$, will not do, since the first protocol still stands, and this generalisation, which

would fit the second, would not fit the first. The best course now will be to look for some third factor, z, whose variations will enable us to arrive at a generalisation which will fit both the protocols. So we now arrive at a third protocol :

$z=1$	$x=1$	$y=2$	$z=2$	$x=1$	$y=4$
$z=1$	$x=2$	$y=4$	$z=2$	$x=2$	$y=8$
$z=1$	$x=3$	$y=6$	$z=2$	$x=3$	$y=12$
$z=1$	$x=4$	$y=8$	$z=2$	$x=4$	$y=16$

Then we derive the revised and corrected generalisation :

$$y = 2\,(zx).$$

The " logical analysis of science," then, shows how the whole system of scientific statements is founded on protocol statements. It further shows how a scientific statement is of the nature of a generalisation or rule which sums up a set of protocol statements, and forecasts further statements of the same set.

For instance, the generalisation, $y = 2\,(zx)$, sums up the set of protocol statements on which it was based, and forecasts further statements of the same set—as for example, if we have : $z=5$ and $x=3$, then we shall have $y=30$.

Thus the whole logic of science is expressed in a purely formal syntactical way. We deal with nothing but statements and the formal relations of statements—not with the meaning of statements, nor with objective reality and the relation of statements to objective reality.

Thus science is based on given protocol statements ; and science progresses and is tested and verified by the comparison of scientific statements—not with reality—but with further relevant protocol statements.

This result is summed up by a follower of Carnap, Neurath, as follows :—

" Sentences are to be compared with sentences, not with ' experiences,' not with a ' world,' nor with anything else. All these senseless duplications belong to a more or less refined metaphysics, and are therefore to be rejected. Every new sentence is confronted with the totality of sentences which are present and which have been brought into agreement. *Then a sentence is called correct if it can be brought into the system.* Whatever we cannot systematise is rejected as incorrect. Instead of

rejecting the new sentences we can also, wherever we find it generally difficult to make a decision, alter the whole system of sentences until the new sentence can be included. . . . In the present theory we always remain within the realm of speech-thinking."[1]

Carnap makes some interesting applications of this general " logical analysis of science " to particular sciences. Each science is distinguished by its own " language," and he speaks of the " various languages " which " can be distinguished in science."

Now although science, as distinct from philosophy or " the logical analysis of science," speaks in an " object-language " (that is, in the material mode, is about objects), nevertheless " the questions of the kinds of facts and objects referred to by the various sciences are revealed as pseudo-questions." Thus to give an account of any science, nothing should be said of " the kinds of facts and objects " which that science studies, how it studies them, or what it finds out about them. On the contrary, the science should be regarded simply as a system for producing statements in its own peculiar language.

Thus Carnap says of Economics : " Let us for example consider the language of economics, which can be characterised in somewhat the following fashion, i.e., by the fact that its sentences can be constructed from expressions ' supply and demand,' ' wage,' ' price,' etc., put together in such and such a way."[2]

Thus it appears that neither economics nor the logical analysis of economics is in the least concerned with " the kinds of facts " which underlie, say, the wages system. Economics is a " language " based on protocols in which words like " wages " occur.

5. *Physicalism*

Having given this general " logical analysis of science," and having shown that the different sciences are distinguished by their " various languages," Carnap proceeds to make a sweeping generalisation which must be regarded as the crowning point in his particular " system."

[1] Neurath : *Sociology in Physicalism*, quoted by Weinberg : *An Examination of Logical Positivism*, p. 277.

[2] Carnap : *The Unity of Science*.

The aim of this generalisation is to show that there can be one universal language of science, into which all statements in all the different languages of the different sciences can be translated. Thus instead of being a mere assembly of different languages, science is revealed as a unity—" the unity of science " is established by showing that there is a universal language of science into which all scientific statements can be translated.

This language is called " the physical language " ; and this theory of " the unity of science " is called " physicalism."

To slip for one sentence into the material mode of speech, this " physicalist " theory of the unity of science is supposed to show that all science is about one world, and to indicate the fundamental physical nature of that world. But since to say this is vulgar " metaphysics," I shall return forthwith to " the correct formal mode of speech."

The theory of physicalism is capable of very simple expression. There is a language, called the physical language, into which all scientific statements can be translated ; in other words, there is a statement in the physical language equipollent to any scientific statement.

Carnap proceeds to define the physical language in both the formal and material modes of speech :—

" The physical language is characterised by the fact that statements of the simplest form :—

" *Formal Mode*	*Material Mode*
attach to a specific set of co-ordinates (three space and one time co-ordinate) a definite value or range of values of physical state.	express a quantitatively determined property of a definite position at a definite time."[1]

And he thus sums up the theory of physicalism :

" Our investigations of the various departments of science therefore lead to the conclusion :—

Formal Mode	*Material Mode*
that every scientific statement can be translated into physical language.	that every fact contained in the subject matter of science can be described in physical language."[2]

[1] Carnap : *The Unity of Science*.
[2] Ibid.

Carnap also explains that not only scientific generalisations but the protocols on which those generalisations are based, and by which they are tested, can all be translated into physical language. Thus :—

" Formal Mode	*Material Mode*
Statements in protocol language can be translated into physical language.	Given direct experiences are physical, i.e., spatio-temporal events."[1]

" The physical language," Carnap concludes, " is a universal language, and, since no other is known, the language of all science. . . .

" It is convenient of course for each department of science to have a special terminology adapted to its distinct subject matter." (Question : Isn't this " metaphysics ? ") " All our thesis asserts is that immediately these terminologies are arranged in the form of a system of definitions, they must ultimately refer back to physical determinations. . . . If we have a single language for the whole of science, the cleavage between different departments disappears. Hence the thesis of physicalism leads to the thesis of the unity of science."[2]

6. *Materialism—Methodical and Purified*

Lastly, on the basis of this " thesis," it turns out that Carnap is a materialist—a " methodical " materialist.

" Our view that protocols constitute the basis of the entire scientific edifice might be termed Methodical Positivism," Carnap writes. " Similarly the thesis that the physical language is the universal language might be denoted as Methodical Materialism. . . . Our approach has often been termed positivist ; it might equally well be termed materialist. No objection can be made to such a title, provided that the distinction between the older form of Materialism, and Methodical Materialism—the same theory in a purified form —is not neglected. Nevertheless for the sake of clarity we would prefer the name Physicalism. For our theory is that the physical language is the universal language and can therefore serve as the basic language of science."[3]

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[1] Carnap : *The Unity of Science.*

[2] Ibid.

[3] Ibid.

Thus it would appear that pure empiricism, logical analysis, logical positivism, on the one hand, and materialism on the other hand, which throughout the years, and in the pages of this book in particular, have been at loggerheads, are at last reconciled by the physicalist theory of Carnap.

Hegel once likened " The Absolute," in which all different or conflicting things were supposed to be reconciled and to become identical, to " the night in which all cows are black."[1] Maybe the theory of physicalism is the same.

But it must be insisted that the " Methodical Materialism " of Carnap is a theory which moves in the realm of " logical syntax " or " speech-thinking " exclusively. It is a theory about the syntax of the language of science, and forbids us to think about the " kinds of facts and objects " referred to by any science.

Thus Carnap states : " All statements belonging to metaphysics, regulative ethics, and metaphysical epistemology . . . are in fact unverifiable and therefore unscientific. We are accustomed to describe such statements as nonsense. . . . We make no assertions as to whether the given is real and the physical world appearance, or vice versa ; for logical analysis shows that such assertions belong to the class of unverifiable pseudo-statements."[2]

Such is in general outline the philosophy of Carnap, and of the logical positivists and physicalists.

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[1] Hegel : *The Phenomenology of Mind*, Preface.

[2] Carnap : *The Unity of Science*.

CHAPTER II

LOGICAL POSITIVISM (2)

1. *The "Analysis" of Science*

THE logical (or "methodical") positivists claim that their "logical analysis of science" is entirely free from the dubious subjectivism and solipsism which characterised the theories of Mach, Russell or Wittgenstein. These "methodical materialists" claim indeed that their analysis is entirely free from "metaphysics" of any sort, whether the "metaphysics" of the Berkeley-Hume tradition or that of the Bacon-Hobbes tradition.

Perhaps it is. But it is only free from such influences because it refuses to say anything about the *content* of science or the *meaning* of science, and its relations to human life and the real world in which that life is led; because it deals only with *words* and not with the meaning and justification of those words; and because in fact it does not regard science as *knowledge* at all, not even as knowledge relating to "my own experience."

A whole chain of philosophers, from Berkeley to Wittgenstein, have "interpreted" or "analysed" science, in order to make out that its subject matter is restricted to the order and arrangement of the "impressions," "elements" or "sense-data" found in sense-experience. And by means of such an "interpretation" or "analysis" they have obscured and covered up the *objective reference* of science, as scientific *knowledge* of the objective material world.

Carnap's "analysis" of science, although he studiously tries to avoid subjectivist conclusions, and calls himself a materialist, is in effect exactly the same. For this analysis *also* obscures and covers up the objective reference of science, as scientific knowledge of the objective material world. It does this by refusing to allow anything to be said of the content or meaning of science, and virtually saying that science has no

reference at all, either to the objective world, or to the world of experience, or to anything else.

It has always been an essential argument of the pure empiricists, from Berkeley to Wittgenstein, that any talk of the objective material world, or of matter, is senseless " metaphysics." Carnap repeats this argument. Only he adds that the same applies to Berkeley's and Wittgenstein's talk of experience. For : " We make no assertions as to whether the given (i.e., given experience) is real and the physical world appearance, or vice versa ; for logical analysis shows that such assertions belong to the class of unverifiable pseudo-statements."

In other words, " we make no assertions " as to what science is about, and " we " will not allow anyone else to make such assertions, for they have no meaning. Science is to be regarded as a set of statements, founded on certain given primitive protocol statements, and tested and verified also by reference to such protocol statements ; and science does not compare its statements " with experience, nor with a world, nor with anything else."

Very clearly, therefore, this is to confound and cover up the objective reference of science, as effectively as it was confounded by the most dogmatic subjectivism.

Those who, after long puzzling about the meaning of science and the extent or limitation of possible scientific knowledge, at length embrace the principles of " logical positivism " and " the logical analysis of science," are in the same happy position as the crew described by Lewis Carroll in *The Hunting of the Snark :*

> " Other maps are such shapes, with their islands and capes,
> But we have our brave Captain to thank,
> (So the crew would protest) that he's bought us the best—
> A perfect and absolute blank ! "

It is important not to be misled by Carnap's distinction between " object sentences " and " syntactical sentences." The " logical analysis of science " consists of syntactical sentences, but science itself does not consist of syntactical sentences but of object sentences. Expressed in the material mode, it is about objects.

Very well then, it will be said, science is about objects.

So why complain that this analysis confounds the objective reference of science?

However, " science is about objects " is equivalent to saying, and would be more correctly expressed by saying, that " science consists of object sentences " ; that is, that it consists of sentences in which terms like " supply and demand," " wages," " vitamins," " atoms," " electrons," etc., etc., occur. No one will dispute this obvious truth—it is only a statement about the language of science, and is quite trivial. But when it is asked, Do the terms employed by science stand for anything in the objective world?—then Carnap replies that we must not ask such " pseudo-questions."

Hence, while it may be agreed that science is expressed in an object language, this statement does not advance us a step further towards understanding the objective reference of science.

For when we speak of the objective reference of science, we are not thinking so much of the syntax of the language of science, as of the relations between scientific thought and material reality. Carnap says, however, that we must not think of the relations between statements and their objects, or of thought and reality, but only of the relations between statements and other statements, and of thoughts with thoughts.

Hence his assertion that scientific statements are " object sentences " does not remove the confusion introduced into the question of the objective reference of science, but only makes that confusion a little more confounded.

Carnap here shows the same trickiness with regard to the formulation of his conclusions as I remarked in the case of Wittgenstein. What his conclusions plainly mean—namely, that we do not have knowledge of the objective material world—is not allowed to be said. Carnap says, of course, that he does not deny the objectivity of our knowledge—he merely makes no assertions about it, one way or the other. But if you do not deny the objectivity of our knowledge, why go to such elaborate lengths to try to prevent it from being asserted? What is the purpose of this? What is its meaning? Simply to obscure and to cover up the objectivity of our knowledge.

Thus Carnap's " logical analysis," however novel some of

its features may be, is essentially a continuation of the Berkeley-Wittgenstein tradition.

I shall now proceed to examine it in more detail.

2. *Protocol Statements*

The conception of the protocol, of "protocol statements" and of the "protocol language," is clearly of key importance in Carnap's "logic of science." Protocols not only form the ultimate basis of the whole system of scientific statements, but scientific statements are ultimately tested and verified, accepted, rejected or revised, by comparing them with the protocols.

Hence it is of some importance to investigate exactly what these protocols are supposed to be.

The type of "analysis" undertaken by Russell and Wittgenstein purported to show how all scientific propositions, and indeed all propositions whatever, were derived from absolutely elementary propositions. Thus the ultimate data on which science was alleged to be founded were expressed in absolutely elementary propositions, and scientific generalisations were alleged in the last analysis to have absolutely elementary propositions as their instances.

Carnap would claim to have purged logical analysis of the "metaphysical" conception of the absolutely elementary proposition. Nevertheless, in his logical syntax of the language of science, protocol statements play exactly the same part as did the absolutely elementary propositions in the less "pure" and "formalised" analysis of Russell and Wittgenstein.

The conception of the protocol is only a new version of the conception of the absolutely elementary proposition. Thus protocol statements are the ultimate data—the "simplest" statements, which "need no justification"; and scientific statements are tested by reference to protocol statements, in the way that generalisations were tested by reference to the absolutely elementary propositions which were their instances.

And now it turns out that there is exactly the same difficulty in actually locating the ultimate protocols as there was in locating the ultimate elementary propositions.

Thus having given the general definition of a protocol statement, Carnap goes on to ask, in his double-barrelled way :

" *Formal Mode*	*Material Mode*
Question : What kinds of words occur in protocol statements ?	Question : What objects are the elements of given direct experience ? "

And after this question there follows, in his *Unity of Science*, a longish discussion (which it would be tedious to quote, as I have quoted one such discussion already when dealing with an earlier stage of " analysis "), the upshot of which is, that various answers can be given to this question, but it is hard to determine which answer is the right one.

It does not seem to occur to Carnap that the existence of such difficulties suggests that the question which gave rise to them must be a " pseudo-question," and that the whole method of analysis which gave rise to such a " pseudo-question " must be a " pseudo-" method.

The difficulty is much the same if we begin to ask, not only what the protocols are like, but how we arrive at them. The protocols are the ultimate basis of science ; but we must have some method whereby we may select and arrive at the statements which constitute this ultimate basis. Carnap, however, does not suggest such a method. He tells us, in the formal mode, that protocols are " statements needing no justification " ; and in the material mode, that they " describe directly given experience or phenomena." But how we may arrive at such ultimate and absolutely elementary statements, and what they are like when we do arrive at them, he does not tell us.

Hence it is only too clear that " the logical analysis of science," while formally it is very precise, begins to fail the moment it is applied to any actual body of scientific knowledge. For it says at the outset that science is founded on protocols, and then fails to say how the protocols may be recognised.

Precision in form may, and in this case does, mask the greatest confusion and lack of precision in content.

The difficulty here indicated has been tackled in what may appear a most bold and radical way by Carnap's follower, Neurath. But Neurath's philosophising only makes the inadequacy and confusing character of the " analysis " still more obvious.

It will be remembered that according to Carnap's logical " Principle of Tolerance," the syntax of a language may be chosen quite arbitrarily. Neurath applies this " principle " to science. According to him, it is only " a more or less refined metaphysics " to suppose that protocols are " the simplest statements," " needing no justification," " describing directly given experience," and so on. Scientists may therefore quite arbitrarily select whatever sentences they like to serve as their protocols—and if they get into any difficulties, they may reject these protocols and use others instead.

So the question as to which sentences are protocols and which are not, is decided from time to time by agreement between scientists. How they make that decision is their own business, and has nothing to do with logic or philosophy. And the study of the principles according to which such decisions are made is simply a matter of " sociology "—namely, a new branch of sociology which studies the peculiar social behaviour of scientists.[1]

I cannot but regard this very " radical " treatment of science as the *reductio ad absurdum* of the method of " analysis " which gave rise to it. It just dodges the issue of the logical foundations of science. It presents the method of science as merely a method of arbitrarily juggling with statements. And the principles which determine which statements are to be accepted by science, and which rejected, it dismisses by means of the formula : " sociology."

Thus the conception of the ultimate protocol, like its parent the absolutely elementary proposition, gives rise to nothing but difficulties and absurdities.

Two further remarks may be made under this heading.

First, whatever the protocol may or may not be, the " analysis " of science as based on protocols is an analysis which denies that science constitutes objective knowledge ; that is to say, a system of propositions which are verifiable, and whose verification shows that they correspond with objective reality.

For according to this analysis, scientific statements are based on protocols and are verified by comparing them with the protocol. Hence their truth does not consist in any sort

[1] See Weinberg : *An Examination of Logical Positivism*, p. 276.

of correspondence with the objective world, but in correspondence with the protocol. As for the protocol itself, it is just " given," or arbitrarily selected. Hence nowhere is there any test which shows correspondence with the objective world. The " truth " of science does not consist in correspondence with the objective world—that is " a more or less refined metaphysics " ; it consists in a certain internal coherence amongst the statements made by scientists.

Neurath says that how and why scientists arrive at their results may be explained by sociology. But even that will not get him far—for sociology, after all, is itself only a science like the rest, based, presumably, on arbitrarily selected statements. Why a body of " scientific " philosophers should go to such lengths to cover up the fact that science constitutes objective knowledge, is very hard to explain on purely philosophical grounds. But I suspect that, although sociology will not go all the way in explaining why scientists reach the results they do—it will explain why they tackle one problem rather than another, but not the particular solution of the problem which they reach ; yet it will go a long way further in explaining the conclusions reached by some philosophers. For there is evidently a very strong and well-grounded sociological urge to conceal the fact that science constitutes objective truth.

Secondly, what is the real basis for all this theorising about protocols ? For just as the theory of the absolutely elementary proposition had its basis in the fact that we do formulate propositions which are elementary in form, so also the theory of the protocols of science has its basis in the fact that there *are* scientific statements which record observations, as distinct from other statements which formulate theories based on those observations.

All scientific theories arise from observations, and are checked through observations. Hence it is of very great importance in developing the body of scientific knowledge, that the observations should be accurately recorded ; and the more " exact " the science, the more important does this recording of the observations become.

It is this fact that Carnap and the logical positivists are evidently trying to express in their theory about protocols. But they have not expressed it correctly.

If " protocols " are to be defined as " the records of observations," well and good. But in that case :

(1) It cannot be said that they absolutely " require no justification "—for the records of observations do require justification, need to be very carefully checked and verified, and in actual practice not only require justification but receive the justification that they require.

(2) It cannot be said that they " describe directly given experience or phenomena," because what they describe are objective material facts. For instance, if a scientist records readings from a galvanometer, he is not recording his own subjective experience, but he is recording the objective effects of certain physical processes upon a certain physical object, namely, the galvanometer.

(3) Once it has been decided what observations are to be made, there is nothing in the least arbitrary about which records of observations are to be accepted or which rejected.

Where Carnap and his followers have gone astray, and have been led " into insoluble difficulties," is in their arbitrary and dogmatic insistence that the philosophy of science must not move out of the realm of logical syntax, or of " speech-thinking," and must not deal with the meaning of propositions or their relationship with facts. Thus observing that science is based on the records of observations, they try to give a syntactical or formal definition of the records of observations. There can be no such definition. What makes the record of an observation what it is, and gives it its place in the system of science, is the fact that it records an observation—which is a non-formal definition, referring to its meaning. There are no special words, or ways of putting words together, which can be shown to be equivalent to the recording of an observation. The self-imposed search for such a formal definition has led the logical positivists into a number of absurdities. Namely :

(1) They have postulated ultimately simple and non-justifiable statements, which lie at the logical basis of all other statements—corresponding to the absurdity of the absolutely elementary proposition.

(2) In trying to find out how these statements can be recognised, they have committed what they themselves admit

is the unforgivable sin in philosophy—asking questions to which there is no answer.

(3) In then giving up the attempt to answer this question, they have then fallen into an even greater absurdity, namely, supposing that the basic data for science are chosen quite arbitrarily, and that the choice of one scientific theory rather than another is only a matter of " sociology."

And finally (4) having been guilty of these absurdities, they accuse those who hold that science constitutes knowledge of the objective material world of being " metaphysicians " who engage in " idle dispute about pseudo-theses."

3. *The Physical Language*

I now pass on to some considerations about Carnap's theory of " physicalism," which he arrived at on the basis of his " logic of science."

Carnap's " logic of science " lays down a-priori what the logical form of science (or the general " logical syntax " of " the language of science ") must be. The theory of physicalism is derived from a-priori considerations.

The body of science, it is argued, consists in a number of different sciences, each with its own peculiar language and based on its own protocols—but somehow there must be a unity of science. This unity of science cannot be derived from examination of the actual way in which all the different branches of science deal with the same subject matter, namely, the objective material world, because we are forbidden to talk of the objective reference of science, other than simply by saying that science uses an " object-language." Consequently, the argument goes, if there is a unity of science, then this must mean that there is one universal language of science, into which all the statements of all the sciences can be translated.

Thus " the universal language of science " is produced as a means of helping the logical theory out of a difficulty. The necessity of such a language is based on its necessity in the logical theory of Carnap. It is not based at all on an examination of science and the subject matter of science. If we consider, not logical theories, but the actual sciences, as studies of various aspects of the real material world, then we can perceive no necessity whatever why all those different aspects

Here, as was the case with Russell and Wittgenstein and their " atomic facts," Carnap's analysis leads at last to an a-priori presentation of the ultimate nature of the world.

Carnap calls this " Methodical Materialism," which is " a purified form " of " the older materialism." But where the " purification " comes in, it is hard to see. The theory of physicalism, expressed in its material mode, is merely a dogmatic statement of the very crudest form of " the older " mechanical materialism, which " reduces " everything to physical motions and says that qualitative differences are illusory. The advance of science itself has abundantly shown that this old cramped mechanical view of the nature of the material world is quite inadequate to explain the varied phenomena which we meet with in actual practice.

Nevertheless, there is a certain universality about physics. Considering the different forms of motion in the world, then every form of motion contains a physical motion.[1]

Matter enters into various forms of organisation. Under certain conditions, only physical motions take place. Under other conditions, the physical changes give rise to the organisation of chemical atoms and molecules, and chemical processes occur on the basis of physical processes. Under higher conditions of organisation, chemical processes give rise to organic processes, and organic processes to human thought and social life. At each stage of organisation, relations and corresponding laws of motion arise, which are not physical relations or laws, qualities come into being which are not physical qualities—but they have a physical basis. Physical phenomena, in this sense, are basic and universal.

But Carnap's theory of physicalism appears to distort the real nature of the universality of physics, that is, of the universality and basic character of physical motion. So long, indeed, as we have to deal purely with " the language of science," and are not allowed to deal with the content of science, and the kind of facts science is expressing, the real nature of the universality of physics and of " the unity of science " cannot be grasped.

Could we write a complete history of the evolution of the world, then the successive development of higher levels of the

[1] Cf. Engels : *Dialectics of Nature*, p. 36.

organisation of matter would be dealt with in that history. The first chapter would deal simply with physical motions. But it would be shown how those physical motions give rise to tendencies towards forming organisations of a more complex kind, and at a certain stage such tendencies are able to express themselves in the formation of molecules. Once this has come about, then there appear in the world new processes, chemical processes, the processes of chemical change and combination. Then come those particular chemical combinations which give rise to the phenomena of life. The evolution of living organisation gives rise to such an organisation as the brain, leading to conscious and purposive modes of life, social life, social history, and so on. Could then this history be written entirely in physical terms? No, it could not. Such a physical history of the world would not be able to describe all the new relationships, qualities and laws of motion which were successively appearing in the world in the course of the total world development.

To suppose that the history of the world would be only physical history is in fact a purely " metaphysical " supposition. This supposition is the supposition that physical events are in some absolute sense " the ultimate reality," so that a complete physical account of the world would say what the world ultimately is. But the truth is, that to approximate to a complete picture of the world, it would be necessary to describe the events at all levels. For instance, to deal in any completeness with the life of a human being, it would be necessary to study him socially, economically, psychologically, physiologically, chemically, etc., as well as physically: and the complex of motions that constitutes his life could not be " reduced " to physical motions.

4. *Methodical Materialism and Unmethodical Subjectivism*

On the basis of his theory of " physicalism," Carnap declared himself " a methodical materialist." I have shown how this " materialism " is in fact crude, dogmatic and untenable, and is in fact not materialism at all, for it is in truth only a theory about words. But it can also be shown how this " pseudo " materialism implies the very opposite of materialism, namely,

the same subjectivism and solipsism as characterised all Carnap's philosophical ancestors—Berkeley, Hume, Mach, Russell, Wittgenstein.

Consider, for example, Carnap's statement, already quoted : " Suppose that a positivist maintains the thesis, ' A thing is a complex of sense-data,' and a realist the thesis, ' A thing is a complex of atoms.' . . . If we transfer to the formal mode of speech, it is in this case possible to reconcile the two theses."

Here Carnap proposes to " reconcile " materialism and subjectivism—the view that things have objective material being independent of all consciousness, and the view that things are complexes of sense-data. He effects this " reconciliation " by saying that to describe things in terms of sense-data and to describe them in material terms are not contradictory descriptions, but simply two alternative uses of language.

But if it is true *both* that things are complexes of atoms *and* that things are complexes of sense-data, this means that atoms are constructions from sense-data ; for if atoms have objective material existence independent of consciousness, then if things *are* complexes of atoms they certainly are *not* complexes of sense-data.

Thus the " reconciliation " of materialism and subjectivism (or as Carnap says, of " realism " and " positivism "), means in fact the rejection of materialism and the acceptance of subjectivism. For if things can equally well be described in terms of sense-data as in material terms, then subjectivism is true, and materialism false. The " transference to the formal mode of speech " may obscure this fact, but cannot escape it.

Thus, disguised as it may be, there is the same subjectivism in Carnap as permeated the ideas of all his predecessors, from Berkeley to Wittgenstein.

Carnap insists as strongly as Berkeley or Mach or Wittgenstein, that the materialist " thesis " of the existence of the objective material world, and the correspondence of our perceptions and thoughts with this world, is nonsense and mere " metaphysics." He also insists that the opposite doctrine, as put forward by Berkeley or Mach, that what exists consists of our own sensations, ideas, experiences, is equally nonsense and " metaphysics." " We make no assertions as to whether the given is real and the physical world appearance, or vice versa ;

for . . . such assertions belong to the class of unverifiable pseudo-statements."

But this method of settling a philosophical controversy by refusing to recognise its existence will not work. Whoever denies the existence of the material world—whether by saying straight out that it does not exist, or by saying that talk of it is nonsense—cannot escape the opposite position, the position of subjectivism and ultimately of solipsism, which says that nothing exists but sensations, ideas, experiences.

Consider again some of Carnap's statements, already quoted, respecting protocols. " The simplest statements in the protocol language . . . describe directly given experience or phenomena. . . . Question : What objects are the elements of given direct experience ? . . . Our investigations of the various departments of science lead to the conclusion that . . . given direct experiences are physical, i.e., spatio-temporal events."

Here the protocols are clearly supposed to deal with " the elements of direct experience." And since scientific knowledge can hardly deal with data beyond what is given in the protocols, scientific knowledge must deal with " given experience." Since " given experience " is " my experience," this means it would be hard to avoid solipsistic conclusions regarding knowledge, if it were not that " the correct formal mode of speech " comes to the rescue and prevents the obvious meaning and implication of the theory from being definitely stated. Since it is further stated that " given direct experiences are physical, i.e., spatio-temporal events," the form of subjectivism suggested here is similar to that popularised by Mach, according to which physical events are constructions out of elements of immediate or direct experience.[1]

[1] Mr. A. J. Ayer, in a book entitled *Foundations of Empirical Knowledge* (which foundations he selects from the materials provided by a number of different philosophers, but particularly from Carnap), very definitely states the subjectivist conclusion of logical positivism on his last page : " The most we can do is to elaborate a technique for predicting the course of our sensory experience."

CHAPTER 12

LOGICAL POSITIVISM (3)

1. *The "True Logic"*

IN this chapter I shall examine some of the basic philosophical and logical presuppositions from whence Carnap's "analysis" of science was engendered.

Carnap says that it is an error to suppose that logical and philosophical principles "must constitute a faithful rendering of 'the true logic.'"

This statement has most obvious reference to the principles of logic in the narrow sense, that is, to what are sometimes called "the laws of thought" or "the principles of deductive inference," the type of principles that are worked out in systems of formal logic—such as: "p, and p implies q, implies q," or "if p implies q, and q implies r, then p implies r." Such principles, says Carnap, are merely syntactical rules. More precisely, they are syntactical rules of "formation and transformation." In no sense do they constitute a "rendering of the true logic." There is no objective standard determining their validity.

If by "the true logic" is here meant some transcendent system of timeless eternal truth, which has being independent of all thought and all existence, then doubtless Carnap is right. If we set up the platonic "ideal world" as the eternal truth, which must be mirrored in our logic, then we are demanding that logic must conform to something which is merely a figment of the philosophical imagination.

Russell, for instance, however unplatonic may have been his views on other subjects, did hold such platonic views about the subject of logic. "We shall find it convenient only to speak of things *existing* when they are in time," he wrote. "But universals do not exist in this sense; we shall say that they *subsist* or *have being*, where 'being' is opposed to 'existence' as being timeless. The world of universals, therefore, may also be described as the world of being. The world of being is unchangeable, rigid, exact, delightful to the mathematician,

the logician, the builder of metaphysical systems, and all who love perfection more than life."[1]

No doubt Carnap is quite right when he says that the principles of logic do not " constitute a faithful rendering of ' the true logic ' " in this sense. But that is not to say that they are merely principles of syntax, which do not in any way conform to the world of being, and to the " logic " of that world, in the sense which would be understood by any ordinary person, who does not retire into the realms of platonic imagination in search of perfection.

There really is a world, in which we live, and which contains objects, events, facts, the passage of time, the transformation of one state of affairs into another. And we in the world perceive, think and act, and formulate the results of our perceptions, thoughts and actions in communicable propositions.

There exist, therefore, relations of correspondence between perceptions, thoughts and propositions, on the one hand, and objective things, events and facts on the other hand. These relations are tested in actual experience, in the practice of life. And in virtue of such relations, propositions represent things more or less correctly or incorrectly, adequately or inadequately ; and moreover, in virtue of such relations, one method of thinking leads to results conformable with realities, while another method of thinking does not.

It follows from this that there must be a sense in which the principles of logic (or laws of thought) do have an objective validity, and represent something more than just syntactical " rules of formation and transformation " as defined by Carnap. It is quite another question, of course, whether " the laws of thought " as formulated in the usual logical text-books are correctly and adequately formulated.

The essential issue here involved is that Carnap deliberately ignores the fact that propositions have a meaning. But yet, if you abstract from the meaning of propositions, that is, their relation with facts, or with the world, then you have ceased to deal with propositions.

To construct a theory of logic on the basis of ignoring that propositions refer to facts, is on a par with constructing a theory of, for instance, money, on the basis of ignoring that

[1] Russell : *Problems of Philosophy*, p. 155.

money is a means of exchange. Some " formal " theory of economics might be constructed on such a basis, but it would not be a theory of money. And that propositions are a means of communicating information, true or false, about the world, can no more be ignored, than that money is a means of promoting the exchange of commodities.

While, then, it remains perfectly true that the principles of logic do have a syntactical aspect—syntactically they certainly do serve as " rules of formation and transformation "—there nevertheless remains more to be said on the matter.

Propositions communicate information. And the principles of logic, or laws of thought, do accordingly possess an objective validity, or if you like " constitute a faithful rendering of the true logic," in the sense that they show that, given certain information, what further is involved in or follows from it.

The validity of logical principles results from this, that the information expressed in the conclusion is involved in or contained in the information expressed in the premises. Understanding this, one is entitled to say that a principle is *valid* ; which is more than just saying that it represents a rule of transformation employed in the syntax of a particular language.

Thus the idea that the principles of logic are just rules of syntax, which in no sense " constitute a rendering of the true logic," arises from Carnap's insistence that we may deal only with the relations between propositions, but not with the relations between propositions and facts. But since the very essence of a proposition lies in that relation, this insistence is an insistence on a false abstraction which falsifies the significance of the principles of logic.

2. *Philosophical Principles as " Syntactical Rules."* *Some Remarks about Time*

Having asserted that the principles of logic, in the strict and narrow sense, are syntactical rules which in no way " constitute a rendering of the true logic," Carnap goes much further, and extends this assertion to the wider sphere of philosophy.

He clearly asserts that all general " philosophical theses "—such as " Time is infinite," " A fact is a combination of objects," or " Matter is prior to mind," or " Motion is the mode of existence of matter "—can be correctly stated only " in the

formal mode." They are not statements about the world, but about the way in which we use language. Such statements do not mirror " the true logic " of the world, but are simply statements of syntax.

Carnap further maintains that the reason why it is so necessary to interpret all such statements strictly as statements of syntax is, that if we attempt to use or interpret such theses as statements about the world, then this must lead to " questions whose discussion ends in contradictions and insoluble difficulties."

Moreover, because they are only statements of syntax, it follows that the choice of one such thesis rather than its opposite, is quite arbitrary. For instance, we can use " a time-language " which postulates an infinite or a finite past ; the choice is one of convenience, not one of giving an account of time which corresponds to its objectively infinite or finite nature. In other words, if we say : " Time has a beginning," or if we say : " The world was created " or : " The world was never created," it is not time or the world we are referring to, but we are merely laying down rules for the use of language. And this will be made clear only if we express such statements strictly " in the formal mode."

It further follows, as Carnap has pointed out, that what have been taken to be contradictions between opposite philosophical standpoints (for example, between idealism and materialism, or between the theistic notion of creation and the atheistic notion that matter is eternal) are in reality not such contradictions, but simply differences between the syntactical rules of language which different groups of people choose to employ. They are mere differences of language, and so the controversies between such groups are only " pseudo- " controversies.

The best and clearest way of examining these assertions would be to take an example. Here then is an example from " Logical Syntax " of a general philosophical thesis, which is correctly to be formulated " in the formal mode " :

Material Mode	*Formal Mode*
Time is infinite in both directions, forwards and backwards.	Every positive and negative real number expression can be used as a time-co-ordinate.

It must be noted that, according to Carnap, the discussion of such a thesis in " the material mode " must give rise to " insoluble difficulties and contradictions."

I am going to test this assertion by trying the experiment of a brief discussion.

In this example it may at once be remarked that the " difficulties and contradictions " referred to had already been encountered by Kant in his discussion of this very question about the infinity or otherwise of time.

In what he called *The First Antinomy of Pure Reason*, Kant discussed whether time has a beginning or not ; and he came to the conclusion that it could be proved equally conclusively both that time has a beginning and that it has none. This can certainly be recognised as both a difficulty and a contradiction.

As is well known, Kant proposed to remove this difficulty and to solve this contradiction by maintaining that time does not apply to " things in themselves " at all, but is merely a phenomenal appearance arising from the peculiar way in which we apprehend things.

It appears to me that Carnap's way of avoiding the alleged difficulties is not essentially different from Kant's. Kant hoped to avoid the alleged difficulties by transferring time from the sphere of " things in themselves " to the sphere of " phenomena." Carnap proposes to avoid the alleged difficulties by translating theses about time into theses " in the formal mode," dealing not with the world but with the use of words.

Thus according to Carnap, to assert the infinity of time—or on the other hand to assert that time has a beginning or an end—is not to assert anything about the world. It is simply a statement of a verbal convention which we propose to employ. And if it is asked why we should adopt this convention rather than some other—rather than the convention, for instance, which fixes a beginning or an end to time—then the answer is that this is the convention customarily employed in the science of physics ; but if for some reason physicists find it convenient to use another convention instead, they are at liberty to do so. It must not be supposed that the permission accorded in this convention to use any real number as a time-coordinate is " justified " because it corresponds to the really

infinite nature of time. We must not suppose this, because it is a prejudice to suppose that such propositions should " constitute a faithful rendering of the true logic " of the world. On the contrary, " we have in every respect complete liberty with regard to the forms of language."

But is this account of the significance of the thesis of the infinity of time a correct account? I do not think it is. Forgetting, then, all about the formulation " in the formal mode," I shall proceed with the experiment of discussing the infinity of time " in the material mode," in order to test whether such discussion does so inevitably lead to difficulties and contradictions.

But to begin with, there is one point to make about words. For " time " is a somewhat obscure and confusing word. It must be understood, then, that if we make assertions about time, those assertions generally refer to nothing other than the events which take place in a time-order, and are about the time-order of those events. For time (and space) are not like a box, in which events are placed, but which could just as well exist empty without any events inside. Time is moreover a measurable quantity, though periods of time can be measured in many different ways.

It results from this that there can be a certain ambiguity associated with the word " time " ; and so, in discussing time and wishing to avoid difficulties, we must try to make clear what it is we do mean by " time."

" Time " can have a double meaning. On the one hand it can be used to refer to some definite sequence of events the periods of which can be measured on some definite time-scale. But on the other hand it *can* be used in a wider sense, as referring not to any definite measurable time-order, but in a general way to any motion or sequence of events. Clearly, if we are to use real numbers as time-coordinates, it is to a definite time-order in the first sense that we must be referring ; for unless there exists some definite scale of measurement there is no possibility of using real numbers as time-coordinates.

Let us take it, then, that in speaking about time we are referring to a definite sequence of events, the periods of which can be measured on the scale of the motions of the heavenly bodies, or of radiation, or of the periodicity of atomic processes.

In that case, it seems perfectly in order to ask, " in the material mode " ; Did time have a beginning?—meaning : Did this physical time-order of events, to which we ourselves belong, and the periods of which can be measured in terms of our clocks or other scales of time-measurement, have a beginning ? We can even ask, not merely did it have a beginning, but *when* did it begin ?

As proof of this it may be mentioned that according to the cosmology being worked out by E. A. Milne, the change in time of the physical properties of events is such that the time-order must have had a beginning, which took place approximately two thousand million years ago. This hypothesis is obviously of extraordinary philosophical interest. But whether it is to be accepted or not is not to be decided by philosophical arguments a-priori (of the sort that lead to "insoluble difficulties and contradictions "), but is to be decided in the way that a decision is reached about all scientific hypotheses, that is, by reference to its explanatory power and the extent to which it can be verified.

For instance, the fact that, on the basis of Milne's theory, J. B. S. Haldane was able to give a simultaneous and simple explanation of the origin of the solar system, of double stars, and of the irregularities of the motions of double stars, is decidedly an argument in favour of Milne's theory ; which was already able to explain another and quite different phenomenon, the apparent recession of the spiral nebulae.[1]

Thus it can be noted that the statement that the time-order did have a beginning, may be positively asserted, if we find evidence from the behaviour of things which points to the conclusion that the whole sequence of events to which they belong must have had an origin. But the case appears to be different with the opposite assertion, that the time-order did not have any beginning. For to say that it did not have any beginning could only rest on the negative assurance that so far no evidence pointing to a beginning had been found.

But what follows about time in the wider sense, as referring not to any definite measurable time-order, but in a general way to any motion or sequence of events ?

[1] See Haldane : *Marxist Philosophy and the Sciences*, Ch. 2. Also *Nature*, vol. 155, p. 133 ff, and *American Scientist*, vol. 33, No. 3.

In this wider sense, it would be quite in order to assert that there was a time before time began ; that is to say, before our particular time-order, containing the types of periodic events whereby *we* can measure time, began. Indeed, unless we are going to postulate creation, with all the difficulties which that particular conception does undoubtedly involve, we must suppose that in this wider sense time is infinite, even if in the narrower sense, which allows of our particular form of measurement of time, it had a beginning.

Thus if we are called upon (as in philosophy we are called upon) to try to answer the question : Is time finite or infinite ? then it would be in order to attempt to find an answer along the lines of saying : Both. Any sequence of events of a particular type, such that the period of their development can be measured by a particular time-scale, may be finite ; but there need nevertheless be no creation and no ultimate end.[1]

Now these statements, expressed " in the material mode " as they are, appear not to involve the " difficulties and contradictions " which, according to Carnap, are inevitably produced by such discussions " in the material mode," and which were so ably expounded by Kant for the particular example of time.

This can be shown briefly by quoting from Kant's *First Antinomy*.

The first side of the antinomy proves that time could not have had a beginning, by the argument that to postulate a beginning leads to an impossibility.

" Let us assume," said Kant, " that the world has a beginning. Since the beginning is an existence which is preceded by a time in which the thing is not, there must have been a preceding time in which the world was not, i.e., an empty time. . . ." But " an empty time " is an impossibility. Therefore time cannot have had any beginning.[2]

This difficulty does not arise in the " philosophy of time " which I am suggesting. The argument is not valid, if we are speaking about time in the first sense, that is, as applying to a sequence of events measured on a definite time-scale. For in assuming that " the world " has a beginning, that is, that the

[1] Cf. Haldane : " Time and Eternity," in *Rationalist Review*, 1945.

[2] Kant : *Critique of Pure Reason, Transcendental Dialectic*, II, 2.

physical world of which we are part and which contains the types of periodic events with which we are familiar and by which we define the time-order, has a beginning, we need not assume that that beginning was preceded by " an empty time," in the second wider sense of time. We need not assume any ultimate creation. For the world could have arisen out of something else : the first event in the series of events which constitute our time-order could have been preceded by other events of another type.

The second side of Kant's antinomy proves that time must have had a beginning, by the argument that to suppose it to have been going on for ever leads to an impossibility.

If we do not assume some beginning of time, argued Kant, " then up to every given moment an eternity has elapsed, and there has passed away in the world an infinite series of successive states of things. Now the infinity of a series consists in the fact that it can never be completed. . . . It thus follows that it is impossible for an infinite world-series to have passed away . . ." (i.e., to have been completed). Therefore time must have had a beginning.[1]

The " point " of this argument can also be expressed in a story, which I remember having once heard from Wittgenstein, I forget in what context. It is the story of a very old man, who was heard to gasp out the number " 3." " Thank God, I have finished ! " he exclaimed. " What have you finished ? " he was asked. " I have just finished repeating all the numbers in π backwards," was his reply. It can be recognised that this story says something utterly impossible and inconceivable. Kant's argument is that, if time had no beginning, then the attainment of every moment of time that passes repeats just this same impossibility of the completion of an infinite series.

But the argument is not valid, the difficulty is not involved, if we are speaking of time in the second wider sense. For in assuming that there is no beginning to time in this sense, that is, that there is no ultimate creation, we need not assume that any " infinite world-series " has " passed away." On the contrary, we need assume no " world series " that has not both a beginning and an end. In particular, we need not assume that any *date* in the system of the physical world-series

[1] Kant: *Critique of Pure Reason, Transcendental Dialectic*, II, 2.

in which we live is the last and latest of any *infinite* series of dates, nor that any *period of time* is the last of any *infinite* series of such periods. For we need not assume that the series of periods and dates in question has been going on for ever. On the contrary, we can assume that it had a beginning and is finite, even though that beginning was not an absolute creation.

Incidentally, if we are to speak in this way about " the time before time," then it would appear that we must admit that its content and character is unknown to us. Our knowledge would be limited within our own time-system, to the physical world-order from which we arise and of which we are part. For knowledge itself and the possibility of knowledge must essentially arise from the conditions of the interaction between the conscious human organism and the external world. When therefore we encountered the limits of those conditions and of that world, we would come up against the limits of our knowledge—though within these limits knowledge might be capable of an indefinite development. This thought bears a relation to Spinoza's idea of the " infinite attributes " of " substance." Spinoza said that besides its physical and mental attributes, substance had an infinity of other attributes. Maybe he was right, but not quite in the sense that he intended. Reality could have developed and could develop many forms unknown to us, beyond the physical space-time-system in which we have our being, and which contains the phenomena of our consciousness. If, then, the thought suggested of the finitude and also the eventual complete disappearance of our world, of human consciousness and all its works, seems perhaps pessimistic, this is balanced by the thought of other possibilities, to us unknown but capable of infinite development.

It is now my contention that this example proves the following : That Carnap's statement, which is absolutely basic in his whole philosophy, that it is incorrect to formulate " in the material mode " such a thesis as that of the infinity or finitude of time, because such formulation must lead to " insoluble difficulties and contradictions," is itself incorrect. On the contrary, taking the thesis " in the material mode," as a statement about the world, it can be made reasonably

comprehensible, in a way that leads to neither " contradictions " nor " insoluble difficulties."

Hence there seems to be no good reason why such theses should be regarded as merely " formal " theses about words, and not as " material " statements about the world. Little is gained by such a translation. But what is lost is the whole possibility of explaining the meaning of the questions, and of trying to find at least provisional answers about the subjects with which they deal. In other words, what is lost is the whole possibility of a scientific philosophy.

It may be added briefly, that the same sort of considerations apply to other examples.

For instance, Carnap takes the statement of Wittgenstein : "A fact is a combination of objects (entities, things)." This he translates into " the formal mode " as follows : "A sentence is a series of symbols." This "formal" statement is certainly quite unexceptionable, but it belongs to grammar rather than to philosophy. Turning, however, to " the material mode," it is possible, and indeed desirable, to engage in philosophical discussion about the questions dealt with in this statement of Wittgenstein.

When Wittgenstein says, speaking of the world and not of words, that " the world divides into facts," and that " a fact is a combination of objects," he is making a clear statement of a certain metaphysical theory, which does admittedly lead to considerable difficulties, some of which I have commented on in previous chapters.

But what is the source of these difficulties ?

Their source is not that Wittgenstein should not have attempted to say anything " philosophical " about the world, but that he lays down a-priori a metaphysical theory of the world—that it consists of " atomic facts "—into which the world as we know it obstinately refuses to fit.

And so Wittgenstein's statement should be " corrected," not by translating it into a trivial statement about grammar (which in any case does clearly *not* represent what Wittgenstein meant), but by the more difficult though more interesting procedure of trying to find a more adequate formulation " in the material mode."

And I would suggest that if, instead of taking " facts " and " objects " as ultimate fixed constituents of the world, we

tried to present them rather as derivative from the many-sided and changing *processes* going on in the world, then we could arrive at a much more satisfactory account of things, dealing with the world as it appears to us, and not just with words without consideration of their meaning.

" The world is not to be comprehended as a complex of ready-made *things*, but as a complex of processes, in which apparently stable things, and also their mind-images in our heads, go through an uninterrupted change of coming into being and passing away. . . ."[1]

This, I submit, is an example of a reasonably comprehensible philosophical statement " in the material mode," suggesting a line of philosophical thought which may lead to difficulties, but not difficulties which there is any reason to think " insoluble." And to translate this statement into " the formal mode " would not only not be helpful, but would destroy its whole meaning.

3. *Some Questions of Language*

I have tried to show that it is not true that all philosophical questions can be reduced to questions of language. But having said this, it is further necessary to point out that some questions which (when expressed in the usual " material mode ") seem to be questions about the nature of the world, *are* nevertheless in a sense questions of language.

It is this fact which gives the basis and apparent justification for Carnap's insistence on the necessity of translation " into the formal mode."

Hence it is not enough, in criticism of Carnap, to say simply that not all philosophical questions are questions of language. It is further necessary to sort out which questions are questions of language and which are not.

I must preface that in what follows I am putting forward some brief considerations and proposals rather than attempting to work out here the whole theory of this subject. It is a subject which raises some complicated problems of the logic of science, the full discussion of which would need a great deal more work.

[1] Engels : *Feuerbach*, Ch. 4.

Let us consider a simple example.

It is very generally believed that the nature of the world is such that any two sides of a triangle are greater than the third. Thus if I am standing at one corner of a triangular field, ABC, then if I measure the distance from A to B, it will always be less than from A to C and C to B. And this will be verified by measuring the three sides.

Nevertheless, if I choose to use a different method of measuring lengths from the usual method—for instance, not by a " rigid " scale or by such units as steps, but with an elastic tape—then I can find instances in which two sides of a triangle would not be greater than the third.[1]

Thus two sides of a triangle are or are not greater than the third according to the method of measurement we adopt. The difference, therefore, between someone who asserts that any two sides of a triangle are greater than the third, and someone who asserts the contrary, is not a difference between people making contradictory assertions about real triangles, one of which is true and the other false—for all real triangles will remain exactly the same in either case. It is only a difference between one who uses one mode of measuring the sides of triangles, and " a geometrical language " corresponding thereto, and one who uses another mode of measurement. Thus whether any two sides of a triangle are always greater than the third, is not a question whose answer depends simply on the nature of the world (the objective properties of real triangles), but it is a question of measure and language.

In general, there are many instances in which we can be presented with a choice between different methods of measurement, and different " languages " arising therefrom. According to which method of measurement and which language we use, we may seem to be formulating contradictory statements about the world. But the differences between those statements, correctly understood, are reduced to differences arising from different methods of measurement.

Thus cases in which contradictory statements about the world can be reduced to differences in language sometimes arise from the choice which exists, in describing the world, between different possible methods of measurement. Our

[1] Cp. Eddington : *Space, Time and Gravitation*, p. 3 ff.

description of the material world is often formulated in terms derived from measurements, and according as we use one or another possible method of measurement, our description of the world turns out very differently. Such differences are, then, differences in alternative " languages," not differences between rival world-theories.

The principle here involved can, however, be generalised further.

When we measure anything (for instance, the distance between A and B), what we are doing is to carry out a certain definite operation (such as stretching a tape from A to B), and we then express the distance in terms of the results of that operation.

A measurement is an operation the results of which can be expressed in a quantity. But in general whether we are measuring things or giving non-quantitative descriptions of them, the same principle applies. In formulating propositions about any kind of property or relationship occurring in the world, we do it by carrying out some operation, and then we express what we want to say in terms of the results of that operation. We cannot say or know anything about the world otherwise.

Therefore in so far as there may exist any choice in the mode of operation to be carried out, then a different mode of expression, a different language, will result corresponding to the different mode of operation used. And such expressions may in certain cases be contradictory.

Hence in the most general form the following may be stated. That cases in which contradictory statements about the world can be correctly traced to differences of language, arise from the choice which may exist, in describing the world, between different possible modes of operation for obtaining an expression of the properties of things. According as we use one method or another, our description of the world may turn out very different.

Here it must be insisted that this is already something very different from the contentions of Carnap. Carnap presents a somewhat simplified picture of the free choice which is alleged to exist between different languages with different syntaxes. But the fact is that the choice between different

languages is *derivative* from the choice between different mode of operation for obtaining the expression of facts. And th syntax of the language is derivative from the character of th method of operation and from what follows if we are to expres the facts in terms of that method.

We gain knowledge of the world by carrying out operationa activities in the world. And the formulation of our con clusions about the same facts will be different, and may ever be contradictory, according as they are based on one or anothe method.

There also arises this point, that an operation has a purpose And hence it is certainly not the case that any choice of methoc which exists is an absolutely free and arbitrary choice. For a given purpose a given method will probably be better thar any other.

To take an example from methods of measurement. It is certainly better for most purposes to measure lengths in the way in which we do measure them, so that two sides of a triangle are always greater than the third, than to measure them with an elastic tape ; for people who used elastic tapes would not find themselves in possession of much useful information for the guidance of their normal affairs.

In what follows I shall, for the sake of simplicity, confine my remarks in the first place to examples of measurement. How do different methods of measurement give rise to different languages ?

Every method of measurement depends upon the selection of a unit of measurement. The method of measurement, or rather the expression of the results of the measurement, entails the convention that all the units are the same. But that all the units are the same, is not a statement of fact. It is the statement of a convention which is adopted in the expression of facts in accordance with the given method of measurement. (In Carnap's phraseology, it is a statement of the syntax of the language which we choose to employ.)

For example, suppose we measure lengths with a foot rule. We then express all distances all over the world in terms of feet. But is it a fact that one foot is the same length in Timbuctoo as in London ? This is not a question of fact. For that one foot is always the same length is a convention. If

we liked, we could say that feet got longer (or shorter) the greater the distance from London. We do not say this, because it would introduce unnecessary complications into our description of the world. But if we did decide to speak in this way, then the geography taught at schools would be rather different from that taught at present, and also we would not be taught euclidian geometry.

To take another example. Do similar atomic processes always continue at the same speed? Again, there is a convention involved in the question. It depends on your system of measuring and calculating times. Thus according to E. A. Milne we can measure time either on the " kinematic " scale or on the " dynamic " scale. " We can make our calculations using either kinematical or dynamical time, and every verifiable result will be just the same. Nevertheless it is roughly true to say that radiation keeps kinematical time and matter dynamical time."[1] Does radiation keep the right time and matter get fast or slow, or vice versa? This is not a question of fact, but of language, depending on your method of measuring and calculating time. Which is the right time is simply conventional.

It can be seen from these examples that many questions raised in contemporary physical theories of " the expanding universe," which appear to be extremely puzzling if understood " in the material mode," are in reality measurement and language questions. Is the whole universe expanding or not? That depends on how you look at it. At the present stage of physical science, the problem of sorting out questions which are matters of convention from those which are matters of fact, is a problem which essentially has to be tackled if a coherent picture of the material world is to emerge.

The reason why such questions of language, and of " the logical analysis of our language," have come forward rather prominently in the recent developments of the philosophy of science, arises from the development of science itself, and in the first place from the theory of relativity.

Let us say that there is Space, infinitely extended in three dimensions, and that euclidian geometry is true of it; that

[1] Haldane: " New Theory of the Past," *American Scientist*, vol. 33, No. 3, p. 131.

there is also Time, which flows evenly without beginning or end ; and that there is also Matter, bits of which are scattered all over space and act on each other in time with forces proportional to their distances. In that case everything must have an absolute measure. And the question of whether two sides of a triangle are greater than the third, of whether a foot always stays the same length, of whether atomic processes are speeding up or slowing down or going on at the same rate, of whether everything in the universe is expanding or contracting or staying the same size—are all questions of fact. But the fact that we are never able to establish such absolute measures is what has led to the rejection of this whole metaphysical theory.

We reject, then, the metaphysical theory that the world consists of (*a*) space, (*b*) time and (*c*) matter, which for a long time was uncritically accepted by science (because science had not yet advanced to a point where it made any difference whether you accepted this theory or not). This involves at once the realisation that many questions which on the old view were regarded as questions of fact are correctly to be understood as questions of language. It involves the realisation that in formulating a description of the world we must often be careful to specify that this is the description according to a particular set of observers using particular methods, and that other observers using other methods could describe the same facts in a different way.

But does this involve that we should say that there is no material world at all ? Or alternatively, that we must say that whether there is a material world or not is just another question of language ?

Of course not.

There is a world. There is an objective order of events in space and time. There are objective processes. We ourselves are a part of the world and know about it by living in it. And different aspects of the truth about the world are variously expressed in different ways according to the methods which we use for discovering and formulating that truth, and the different conventions which we accordingly employ for its expression.

Thus : " Space is real as a system of relationships between

material objects or events. But it has no absolute existence apart from matter, and a belief in its existence apart from matter is a step away from materialism towards metaphysics. The order of events in time within a given material system is an objective fact. The scale on which they are to be measured is a matter of convenience."[1]

Next arises the consideration (already referred to) that the choice between different possible methods of measurement and different conventions, is not a purely arbitrary choice, but that one convention is *better* than another for a given purpose.

Here the meaning, or at least an important part of the meaning, of " better " appears to be as follows. That one convention is better than another if it enables us to express the existence of certain uniformities in nature in which we are interested.

For example, the ancient Egyptians were interested in surveying their land and in predicting the date of the flooding of the Nile. Hence they needed to adopt a method of measuring time and space according to which the year would always take roughly the same time, and Egypt would always stay roughly the same size. Had they measured their lands with elastic tapes, and the time of events by the speed of their high priest's pulse, then they could not have carried out the surveys and predictions which they wanted. Their fields would have changed size and events would have speeded up or slowed down in a very confusing manner. Much the same considerations continue to apply for us today, and will go on applying until the order of events and the laws of nature become very different from the present.

It should be carefully noted that the statement that a certain method of measurement is better for certain purposes is clearly not a syntactical statement in Carnap's sense. It is not a statement about language, but about the relationship of language with what is expressed by language.

That uniformities exist in nature such that they can be best expressed in terms of certain conventions corresponding to certain methods of measurement, states a truth about nature.

For example, if we take the year as always lasting the same period, and Egypt as always staying the same size, then we

[1] Haldane : *Marxist Philosophy and the Sciences*, p. 67.

shall find regularities in the flooding of the Nile, in the movement of heavenly bodies, and also, when we investigate them, in the movements of atoms and electric charges—obviously this expresses an important truth about nature, namely, about the character of the processes involved in such events as the flooding of rivers, the movement of the heavenly bodies, and the movements of atoms.

When *new* discoveries are made and *new* fields of investigation opened out, this may often lead to the rejection, or at least the important modification, of former accepted conventions, because these fail in some way in the expression of the new material. And this change in language may in turn raise new questions, and suggest various clues leading to more new discoveries and more new fields of investigation.

Hence at no time can any method, or any language or mode of expression based on it, be regarded as final and perfect, as " the right expression " of " final truth." Thus the continual change and modification in the character of scientific theory as science advances, involving at certain stages what are called " crises " of science, when a whole philosophy, as it were, breaks down, and something new and different has to emerge from the catastrophe.

But it can happen that at one and the same time one convention can be better for one purpose and another for another. If one sort of uniformity is best expressed by one convention, a different sort of uniformity may be such that it is best expressed by quite a different convention. In that case we will appear to have two sets of contradictory results.

An example has already been given in Milne's use of the kinematical and dynamical time-scales.

According to Milne, radiation keeps kinematical time and matter keeps dynamical time, so that it is better to use kinematical time for some purposes and dynamical time for others. On the kinematic time-scale, the whole universe is expanding and the day and year are getting longer, whereas this is not so on the dynamical scale.

If it is the case, then, that two such time-scales can be used, what is the problem raised ? The problem raised is not the " metaphysical " and " insoluble " one of whether the universe is " really " expanding or not. The real problem arises from

the fact that there exists a lack of uniformity between matter and radiation, and therefore the implications and consequences of such a lack of uniformity have to be worked out.

Thus Milne remarks : " It is not a fanciful speculation to see in the interplay of radiation keeping kinematical time with matter obeying the classical laws of mechanics on dynamical time a phenomenon giving rise to the possibility of a change in the universe in time, and so an origin for the action of evolution in both the inorganic and organic universe."[1]

Here, then, the fact (if it is a fact) that kinematical time is better for one purpose and dynamical time for another, and the resulting contradiction between statements based on the one time-scale and those based on the other, reflects the existence of a form of opposition between interacting processes in nature—an opposition that takes the form of matter and radiation " not keeping time."

The existence of forms of opposition between interacting processes in nature is something which inevitably must in the long run result in changes in the whole character of the total process within which the opposition exists.

Thus if it is the case that matter and radiation do not, over long periods of time, keep pace uniformly with one another, then as Milne points out, the resulting " interplay " over long periods would mean that not merely was there an evolution of different types of objects in the universe, but an evolution of the universe itself—a change in the fundamental laws of nature. Such an opposition between matter and radiation would in time bring about a change in the laws of nature, so that the laws of nature themselves could not be regarded as being fixed and eternal but must be subject to change like everything else.

Hence if one convention is better for one purpose and another for another, the resulting " contradictions " need not be dismissed as " mere differences in language." That one convention is better for one purpose and another for another may express the existence of an opposition between different processes in nature ; and the occurrence of the contradiction arising from the use of the rival conventions should therefore provide a clue for the deeper understanding of nature, and suggest the search for a mode of expression which will

[1] See *Nature*, February 3rd, 1945, p. 140.

adequately express the underlying opposition and its consequences, and so get rid of the employment of contradictory formulations for different purposes.

Here is another much simpler example. If the continents on the earth's surface are moving, then location by latitude and longitude and by reference to fixed material objects (for instance, some recognised landmark) must contradict one another over long periods. This contradiction would reflect the existence of the opposition and stress on the earth's surface due to the movement of the continents, and the resulting change in the configuration of the earth's surface.

A very suggestive example can be taken from a sphere other than the use of methods of measurement.

It is possible to describe observed facts in terms of our own sensations—to use, as some philosophers would say, a sense-datum language. This then involves an alternative and contradictory mode of expression to that employed in exact science. For instance, according to one way of speaking we describe the table as " solid," in terms of our sensation when we bump up against it. But in another context the table is anything but solid, but consists mainly of empty space. Again, I can describe the room as containing a number of coloured objects ; or I can describe it in a way that does not allow of the occurrence of such " secondary qualities " as colour. Hence a contradiction.

Some philosophers say that the one language does not describe the real world at all, and that therefore one language is right and the other wrong. Thus certain mechanical materialists have said that it is wrong to say that things are really coloured, and certain subjective idealists have said that it is wrong to think that anything except our sensations of solidity, colour, etc., really exist in the world. Other philosophers, the logical positivists, then appear on the scene and say that the whole controversy is about pseudo-questions, and that all that is involved is alternative uses of language.

But none of these philosophers is correct. The existence of such contradictory formulations expresses the interaction of fundamental opposites in nature, matter and mind, being and consciousness. The content of consciousness reflects reality, but reflects it in its own way, according to its own laws, and

not with an exact correspondence. Hence the contradiction reflects an " interplay " between the external world and its reflection in the human mind, and this interplay is fundamental for understanding the laws of the development of human thought and of human life.

Thus in general, the existence of different alternative methods of operation for arriving at results about the world, and of different languages involving contradictory formulations based on those different methods, is something which can provide important clues for the discovery of oppositional processes at work in nature, and so for the attainment of a deeper understanding of the laws of development.

To sum up.

Firstly. It is true that some questions, which may easily be taken to be questions of fact, are correctly to be understood as questions of language. Such questions can be recognised as arising from the different modes of operation possible for arriving at results expressing the truth. And in what way they are questions of language can be distinguished by analysis of the type of operation in question.

If we fail to recognise that such questions exist, but take them to be questions of fact, then it is quite true that we shall be led into many philosophical difficulties and con,usions. Thus far Carnap is in the right, that it is certainly important in philosophy to be on the look out for such questions arising from the use of language, and to know how to recognise them and to distinguish them.

Secondly. But in opposition to logical positivism, it must be insisted that these questions must be sorted out on the basis that the objective spatial-temporal world does exist external to all consciousness and thought. We ourselves, moreover, exist as part of the world, and gain our knowledge by interaction with the world around us. Our conclusions about the world are therefore to be understood as a representation of the world. But the character of that representation is determined by that of the methods which we adopt in arriving at it. And it can be a representation only of some partial aspect of the whole concrete reality, in terms expressing our own method and point of view.

Hence also it results that when the conclusions formulated

in any particular terms lead to contradictions, then it is not enough to say that such contradictions arise merely from the use of different languages, but the use of those different languages leading to different results can itself express the opposition between different aspects of reality ; and from reflection on this can therefore emerge a fuller and more adequate conception of that reality.

Thirdly. Hence it does not follow by any means that philosophical questions are to be regarded as questions of language. The very contrary follows. Philosophical questions are basically not questions of language, but questions of the nature of the world and of our place in it. But in answering them it is certainly very important to understand the uses of language, and not to be misled into unjustifiable or even meaningless conclusions from misunderstanding the use of language.

Carnap is not wrong in drawing attention to the existence of questions of language. Where he goes wrong is in misinterpreting the significance of those questions. Like many other philosophers, he has got hold of one aspect of the truth, and distorted it into an error.

4. *The Formal Mode as Criterion of Sense and Nonsense*

I now proceed to some other questions arising from Carnap's conception of the essential " correctness " of " the formal mode of speech."

Carnap claims that the simple distinction between the " formal " and " material " modes of speech, and the consistent use of " the formal mode," enables him to avoid those " pseudo-theses " which are, he says, so common in philosophy and philosophical analysis.

" For complete safety," he says, " it would be better to avoid the use of the material mode entirely. . . . If this mode is still to be used, particular care must be taken that the statements expressed are such as might also be expressed in the formal mode. *This is the criterion which distinguishes statements from pseudo-statements in philosophy.*"

This statement is worth examining. Here is a claim that the distinction of the formal from the material mode of speech gives " the criterion which distinguishes statements from

pseudo-statements in philosophy." Can the statements be translated into the formal mode? That is the test.

This test is itself worth testing.

I have several times maintained the materialist thesis that material things exist independent of consciousness. Expressed in the formal mode, this would presumably read something as follows: "Sentences occur containing material-object designations which are not implied by other sentences containing consciousness designations." So evidently the materialist thesis will pass the test, though it gets reduced to a mere statement about language in the process.

But I shall next select a very different type of thesis.

The *Monadology* of Leibniz surely provides a classic example of a philosophical work which abounds in "pseudo-theses," and which is one mass of "metaphysics" from beginning to end. So I shall submit the first proposition of this work to the test.

"The monad . . . is a simple substance."

But this thesis also, this typical metaphysical utterance, will pass the test. It can easily be formalised, something as follows: "Monad designations can occur only as subjects in sentences, and no sentence in which one monad designation occurs implies or is implied by any other sentence in which some other monad designation occurs." And going through the *Monadology*, the whole of it, from the infinity of monads to the pre-established harmony in the best of all possible worlds, can *all* be expressed in the formal mode.[1]

Thus the criterion seems a bit too wide. It lets through even the most notorious "pseudo-thesis."

And there is good reason for this. The expression in the formal mode asserts nothing of the meaning of language or of the truth or falsity of propositions; it simply asserts syntactical rules about sentences and terms in the particular "language" referred to. And bearing this in mind, it can easily be perceived that the translation of every thesis into the formal mode is really a completely trivial operation. Whatever thesis may be asserted, however wildly "metaphysical" it may be, that thesis involves the use of certain terms and of certain

[1] Cf. Russell, *The Philosophy of Leibniz*, where he makes some tentative beginning at the formalising of Leibniz.

syntactical rules governing the use of those terms. *Every* thesis, therefore, can be translated into the formal mode. And therefore the possibility of translation into the formal mode is certainly not, as Carnap claims it is, " the criterion " for distinguishing " statements from pseudo-statements."

What it *does* test is the logical consistency of a thesis. Thus if a theory is self-contradictory, so that it breaks its own " rules," then this will be shown up immediately the theory is formalised. Or again, if terms are used which are not defined, or if terms are used ambiguously, this also may be shown up by the use of the formal mode of speech. In this respect, translation into the formal mode may have on occasion a certain philosophic and scientific utility. But it is far from evident that by " a pseudo-thesis " Carnap means merely a thesis which is self-contradictory. In fact, exactly what he does mean by such derogatory terms as " pseudo-thesis " and " metaphysics " now begins to become very obscure indeed.

In the case of the formalising of such a typical " metaphysical " thesis as Leibniz's one about " monads," someone may object that there is no sense in " monad designations." But this objection is irrelevant. The reply is that we are not concerned with the sense of terms and sentences, but solely with the syntactical rules of the language in which they occur ; and, by the Principle of Tolerance, we can make a language with any syntactical rules we like, and therefore have a perfect right to make a " monad language " for which Leibniz's philosophy expresses the syntactical rules.

Thus far from having provided " the criterion " for distinguishing " statements from pseudo-statements," Carnap's distinction of the formal from the material mode of speech tells us that we can say whatever we like ; it is all one, so long as we invent rules of language and stick to them consistently. Far from finding an infallible " criterion " for distinguishing sense from nonsense in philosophy, we find ourselves utterly unable to determine which theses are sense, which nonsense, which true, which untrue—and utterly unable to understand the meaning of anything. All that is required is to stick to the formal mode of speech, and there is no limit to the flights of metaphysical fancy we may indulge in.

As Carnap says, " Before us lies the boundless ocean of unlimited possibilities."

Carnap's principle, then, that philosophical theses should be translated into the formal mode, and that " a philosophical, i.e., a logical investigation must be an analysis of language," leads to a position where philosophical and logical theses all become merely conventions for the use of language, which throw no light upon the nature of the world and the problems of life, and for which no sort of objective justification can be or ought to be sought. But on the contrary, what is necessary is that we should give a meaning to our terms, that is, be able to formulate our theses in the material mode, and then be able to test, in relation to life and the objective world, whether, or how far, our theses are justified.

But, Carnap warns us, if we think that philosophy deals with the nature of the world—and not with words and empty thoughts but with the relations of thinking and being—then we shall become lost, as many (according to him, all) philosophers have been, in a maze of " pseudo-questions," " difficulties " and " contradictions."

But it is not hard to answer this objection.

The " difficulties," " contradictions," " pseudo-questions," etc., which beset the path of philosophers arise when they try to deduce the ultimate constituents of reality a-priori, and invent terms for these constituents which have no foundations in experience, practice and science. Such methods necessarily lead to illusions and to illusory difficulties, because we can gain knowledge of things only by experiencing and acting upon them, not by withdrawing into our own minds. As examples of such " pseudo-theses " might be cited : the " thinking substance " of the Cartesians, the " monads " of Leibniz, the " neutral elements " of Mach, and the " sense-data," " atomic facts " and " simple objects " of some of our " scientific " and " logical " contemporaries.

The way to avoid such " pseudo-theses " in philosophy is not, therefore, to reject all philosophical statements whatsoever, and to confine our attention to the analysis of language ; but it is to investigate the logical and philosophical foundations of our statements. Is this statement founded in science, experience, practice, or is it founded in some a-priori

speculation? That is the criterion for testing the value of philosophical statements.

And a-priori speculation being the source of "pseudo-theses" in philosophy, it follows that we shall seek to avoid such errors by refusing to embark upon a-priori speculations. It does not follow that we can only avoid such errors by refusing to think about the world at all, and about the real foundations (if any) of our statements, instead confining our thoughts to language and our language to "the formal mode." The latter expedient is like the course said to have been adopted by Origen, who, observing the incontinence rife among men, proceeded to castrate himself. Carnap, observing that to think about the world and our place in it often leads to nonsense, proceeds to perform a mental operation on himself which prevents him from ever thinking about the world at all.

5. *Conclusion*

Let it be admitted that there really is a world in which we live; and that we do not use a language in order to have a game with words, but in order to communicate our thoughts and to communicate information about the world.

Then in thinking and speaking about objects, facts and events, we find that the material we are dealing with comes under various main categories or headings—such as matter, mind, time, space, motion, quantity, quality, object, property, and so on.

Therefore as well as dealing with questions arising from the properties of particular objects and groups of objects or processes, we find also that questions arise in connection with the basic categories.

These, then, are the sort of questions which we may call philosophical questions, as distinct from scientific questions—though in practice the distinction is not a sharp one, and we find that philosophical questions involve scientific ones and vice versa.

Such questions, says Carnap, ought to be formulated strictly "in the formal mode," as questions not about the nature of the world but about language.

What I am maintaining, then, in opposition to Carnap, is that such basic philosophical questions do not refer to language

merely, though confusions may be introduced into them by misuse of language and an understanding of the use of language is relevant to their solution. They do refer to the objective world. And if there is an objective world—as there certainly is—then philosophical statements need to conform to the nature of the world—to " the logic " of the world, if you like to use that expression—and are not mere syntactical rules, which can be postulated arbitrarily since there is no standard to which they should conform.

To this may be added a point very pertinent to Carnap's objection that the discussion of philosophical questions " in the material mode " leads to contradictions and difficulties.

It is a very marked characteristic of the progress of human knowledge that the truth about any subject, or at least a higher approximation to the truth, is often reached as a result of the difficulties and contradictions arising from some partial and one-sided theory, or from the conflict between two or more such alternative theories. Progress is then achieved as a result of a new synthesis which overcomes the onesidedness which gave rise to the difficulties.

For example, I believe that reflection upon the contradiction between the rival theories that time is infinite and that time is finite can enable us to formulate philosophical views about time which solve that contradiction; although further difficulties then very likely present themselves, which call for further work on the subject. Again, reflection upon the difficulties involved in the metaphysical view that the world is " a complex of ready-made things " can lead to a solution of those difficulties along the lines of regarding the world as a complex of processes. And so on. Examples of this dialectical mode of development of knowledge abound in the history of science. For example, there was a contradiction between classical mechanics and new discoveries about radio-activity; and this contradiction was solved in quantum mechanics, which includes classical mechanics as a limiting case. But again, new contradictions and difficulties continue to appear, calling for fresh efforts for their solution. There is at the present time a contradiction in the discovery that the same things behave sometimes like waves and sometimes like particles, and the

solution of this contradiction is not yet fully developed, though no doubt it will be worked out in due course.

It is, then, in reality no objection at all to formulations " in the material mode " that they may give rise to contradictions and difficulties. On the contrary, it is precisely by tackling those contradictions and difficulties that philosophical progress can be achieved. But it will not be achieved by characterising such difficulties as " insoluble," and taking refuge from them in " the formal mode of speech," giving up the endeavour to formulate truth about the world.

In conclusion.

Logical positivism and physicalism, despite its " scientific " and even " materialist " pretentions, is only a variant and repetition of the old Berkeleyan pure empiricism, the essence of which is to " analyse " and " interpret " scientific knowledge in a way to deprive it of all objective materialistic content. Logical positivism represents the final stage of this false and misleading philosophy, wherein science is deprived of any meaning whatever, and is represented as a mere system-building with words.

Logical positivism rejects the historical controversy between idealism and materialism in philosophy, asserting that they are just two languages, and that both depend on the making of pseudo-statements " in the material mode." In this, logical positivism represents the last refuge of idealism.

Throughout, the dogma is advanced that we must not think of the relations of thought and reality, about the objective meaning of our knowledge or about the nature of the world. Instead we must limit our thought to " speech-thinking," referring " only to linguistic forms." But no justification is found for this dogma, which leads only to theoretical helplessness.

The " method " of logical positivism is therefore only a method to kill philosophy, which has always regarded the nature of the world and the relations between thought and reality as its main problems. In place of philosophy it puts word spinning, decked up as " logical analysis."

Logical positivism thus deprives philosophical and scientific thought of its whole content, and is a programme for the impoverishment of thought.

and sometimes cured. But it is not known why cells should begin to behave like this ; and thus the explanation is very far from complete, and we do not know how to prevent cancers. When medical science finds an explanation which will make it possible to control and prevent cancers, then it will have arrived at a more complete explanation of cancer. For such an explanation will not only explain what cancer is, but how it arises.

Again, modern atomic theory is a theory of extraordinary explanatory power in relation to many phenomena, which enables us to produce things and change things in a way that was not possible without the knowledge provided by this theory. This theory postulates small positive and negative charges as the basic physical constituents of matter, and describes their laws of motion. It explains, for instance, the series of elements, and accounts for their atomic weights. It explains the different states of matter—solids, liquids and gases. It has the most important applications in the electrical and metallurgical industries, and in all processes where we are concerned with transforming matter from one state into another.

It must not be concluded from this, however, that the desire for a direct practical application provides the immediate motive for all explanatory theories.

Indeed, many explanatory theories appear to have no direct practical application at all. For instance, we would like to explain the origin of the solar system, and various theories about it exist. But it does not seem likely that any explanation of the solar system, however perfect, would enable us to control the motions of the sun and planets, or to make another such system for ourselves better than the present one.

The need for such explanations arises not merely from direct practical needs but from the general desirability of extending scientific understanding and getting rid of the unknown and inexplicable.

For instance, when physical philosophers in ancient Greece began to work out physical explanations of thunderstorms, although their explanations were faulty and did not enable them to protect themselves against thunder and lightning, they marked a tremendous advance for human thought. For

they began to get rid of superstition and fear of the supernatural, by showing that the thunder was not due to the wrath of Zeus but had a natural origin.

In the same way we still need to explain the origin of the solar system, of the earth, the stars, etc., not because this will have any direct practical application, but because it will banish superstition and advance natural knowledge.

At the same time, it may often turn out that explanations which appear to have no practical application at the time they are first put forward, may turn out later to be of great practical importance. For instance, knowledge of the composition and laws of development of the heavenly bodies, which appears to be knowledge for its own sake, may contribute to knowledge of the sub-atomic properties of matter, whose practical application is very important and immediate indeed.

It should be further noted incidentally, that many such explanations can never be directly verified, and their status must therefore remain a very provisional one, depending on their probability in relation to more general theories.

Thus Jeans' theory that the solar system originated by a star once coming rather close to the sun, and pulling pieces out of the sun by gravitational attraction, is an improbable explanation ; because from what we know of the motions of stars it would be very improbable that such a collision should take place. On the other hand, Haldane's recent theory that the solar system originated through a very energetic photon of light having collided with the sun would be a highly probable explanation, if further evidence should justify the view that the properties of matter change with time in such a way that a long time ago photons of light would have possessed much more energy than is the case at the present stage.

Science does not in fact consist in the statement of scientific laws only, but in terms of those laws it consists in the statement of explanatory theories. An explanatory theory is not the same as a general law. A general law is a statement of the form : " If . . . then . . ." ; but an explanatory theory says : " These *are* the factors which operate, and they operate like this : . . ." Clearly the explanatory theory uses the law, but is not the same as a law. And in terms of the explanatory theory we can recognise and understand the forces operating

in the world, and, under certain conditions, change them, control them, and use them for our own purposes.

Failure to grasp that science explains, leads to some queer and puzzling results.

For example, many writers who philosophise about science, in particular about physical science, seem quite unable to relate the theories of science to the facts of common knowledge. They duplicate the world, and write as though there were two worlds—the world of common experience, of the things and processes which we perceive and encounter in our ordinary lives, on the one hand, and the world of physics on the other hand. Thus in his *Nature of the Physical World*, Eddington had something to say about tables, and made out that there are always two tables: the ordinary table, which we see and touch and have our tea on; and the scientific table, which is studied by physics. The two tables are quite different, for the ordinary one is solid, whereas the scientific table is nearly all empty space. He cannot relate the table as described by physics to the table encountered in ordinary life.[1]

An exactly similar duplication is made by such philosophers as Carnap or Wittgenstein, though they consider themselves and are generally considered as far superior to Eddington in philosophical ability and logical acumen. For them, too, a scientific statement about a table does not relate to the same objects as an ordinary statement about a table. The ordinary statement relates to our ordinary perceptions; the scientific statement relates to the pointer-readings, flashes on screens, etc., etc., which turn up under the specialised conditions of a physical laboratory.

But the truth is, that the scientific theory of the table explains the characteristics and properties of the ordinary table. There is only one world, one table. Scientific theory relates to exactly the same material world, and to the same table, as is perceived and encountered in ordinary life. For example, the scientific theory which presents the table as nearly all empty space, explains how and why the table is solid. Thus the table is solid, that is to say, it resists pressure; when I put the teapot on the table it stands there, and does not fall through. Why? Because when the teapot is put on the

[1] Cf. L. S. Stebbing, *Philosophy and the Physicists*, ch. 3.

table the small objects of which the table is composed keep hitting against those which compose the teapot, and thus cause the teapot to stand on the table and not to fall through. Hence it is explained why the table is solid in relation to such things as teapots—whereas, on the other hand, other things will go right through it ; for example, cosmic rays will go right through the table, because there is nothing to stop them.

This explanation, incidentally, of why bodies, such as tables, are solid, and of what constitutes their solidity, is of very great practical importance. We can, for example, make use of this knowledge if, instead of cutting wood for tables, we set out to make plastic tables out of plastic materials. In that case it is very important to know what conditions bring about solidity, and this scientific knowledge can lead to the construction of tables far more serviceable and far easier to make than the traditional wooden tables.

Thus scientific theory explains the properties of the familiar material world. It does not invent or discover another duplicate world of science.

It can be seen, too, that the denial that scientific theory explains the world is in its tendency entirely reactionary and obscurantist. If the explanatory aim of science is understood, then it can be seen how the advance of scientific explanation advances our power of controlling nature and of organising production for the common welfare of mankind. On the other hand, the denial of the explanatory power of science covers up the potentiality of the use of science for improving human life. If scientific theory is not related to the real material world, but a duplication is invented of the ordinary world and the world of science, then the world we live in and our life in it is presented as something strange and inexplicable.

Lastly, it is worth noting briefly, that logicians and philosophers, in writing about science, often seem to confine their " analysis " to the " exact " sciences, such as physics, chemistry, bio-chemistry, etc., and sometimes even to physics only. But there are other sciences, the historical and social sciences, whose methods are in many respects different, because of the different nature of their subject matter, but which none the less produce scientific explanatory theories.

For instance, the science of history is a science, which can

explain the movement of history. But its methods are very different indeed from those of physics. Thus, for instance, the historian can perform no experiments, and the data on which he bases his theories are not the records of experiments, but are the records of the various historical events. But the science of history does explain history. It shows the factors at work. Thus it shows how the chief governing factor is the method of social production ; how on this basis classes arise ; how the development of social production and the consequent struggle of classes conditions the course of events. In this way it can give a more and more complete explanation, which also enables us in practice to recognise the historical factors at work now, how they operate, and therefore to be able, if we wish, to map out the course of action which is most likely to advance the interests and well-being of the people.

If, then, it is recognised that the aim of science is to formulate explanatory theories, which will give a picture of the different real forces at work in the objective world, and how they operate, so that we can in terms of such theories better control objective forces for our own purposes—then it can be recognised how greatly Carnap's " logic of science," and similar " logical " and " scientific " theories, have misrepresented the character and aim of science.

4. *Scientific Objects*

Science, then, deals with the objective world outside us. It deals with the properties and laws of objective things. As E. Meyerson said : " Science needs the concept of ' thing.' "[1] But nevertheless many doubts are raised as to whether the objects which science studies do really exist. I want in this section to deal with what may be called the status of scientific objects.

Certain types of objects are familiar to us in everyday life—namely, those whose size, constitution and relationship to our senses makes it possible for us to handle and to perceive many of their properties without the use of any special technique.

But such things as the stars, for example, which are very big in relation to our own size, and are a long way away, are shown by science to be very different from what they seem.

[1] Meyerson : *On Explanation in the Sciences*, ch. 1.

We perceive them as little points of light, but investigation assures us that they are in reality bodies of enormous size. And again, other objects are revealed on a smaller scale, whose very existence was never thought of prior to scientific investigation.

In general, things of the same order of size as ourselves are familiar. But science introduces other objects, on the one hand very big ones, on the other hand very small ones. By so doing science explains the properties and behaviour of familiar objects, and helps us to transform and to use them. Such explanation involves, on the one hand, the exploration of the outer environment of the universe within which our life on the earth's surface takes place ; on the other hand, the exploration of the inner " microscopic " make-up of material things.

According to the modern " logic of science," such scientific objects are fictions, and nothing corresponding to the scientific description of them exists. To speak of such objects is only a way of speaking of something else—the order of our experiences, or the data presented in the basic protocols, etc. But yet, if science represents knowledge and explanation of the objective material world, then evidently such scientific objects must be held to exist just as surely and objectively as more familiar objects exist.

For example. We know that the earth is a large spherical body, but rather flattened at the poles, with a diameter of 25,000 miles at the equator. The earth and the other planets all rotate on their axes, and travel in elliptical orbits round the sun, which is very big as well as very hot. The Greek scientist Anaxagoras caused a sensation in the age of Pericles by teaching that the sun was in fact bigger than the whole of Greece : that was only his guess, and recent research has proved that it is enormously bigger than the earth.

These statements are not mere rules for predicting experiences, nor generalisations from certain protocols, but are well-established statements descriptive of the objective world in which we live. They are clear, unambiguous and well-verified statements about the sizes, shapes, and relative motions and distances of the bodies composing the solar system, on the surface of one of which we live our lives.

Moreover, by means of improved astronomical methods, we possess not only considerable knowledge of the solar system, but of the lay-out of the stellar universe of which the solar system itself is a part. Thousands of stars have been charted, not visible to the naked eye, and a considerable body of knowledge established about the relative sizes and distances of the stars, as well as about their general character and composition. It is established that our solar system is a part of one island universe—the system of stars composing the Milky Way ; and that there are many other island universes, appearing to us in the form of spiral nebulæ, the farthest one so far visible being about 140,000,000 light-years away.

All this gives a picture—fairly reliable, though obviously very abstract and incomplete—of our environment in space. It represents a description of the objective material universe in its spatial extension ; not a mere summary of what we may expect to see if we look through telescopes. Our idea of the past history of the universe in time, on the other hand, and of its probable future, is far more incomplete and uncertain ; though a good deal of reliable knowledge has been accumulated as regards the past history of the earth.

Now in passing, it is perhaps interesting to note that when Copernicus, just over four hundred years ago, first put forward his famous hypothesis about the solar system, on which our present astronomical knowledge is based, there was even then some misunderstanding about its significance, similar to the misunderstandings which are being propagated today. Copernicus' *De Revolutionibus* was published after its author's death, and a certain clergyman called Osiander undertook to write a preface. He was afraid that the theory would offend the Church, and therefore he explained in his preface that Copernicus did not mean at all that the earth *really* moved round the sun ; on the contrary, all Copernicus was doing was to invent a system of rules for predicting the apparent motions of the planets more accurately than was done by the previous planetary tables.[1] Osiander anticipated the " logic " of Wittgenstein and Carnap by four hundred years. But in fact this was not what Copernicus was doing ; for the

[1] See A. Wolfe : *History of Science, Technology and Philosophy in the 16th and 17th Centuries*, p. 14.

Copernician theory was a theory which laid the foundations for an entirely new picture of the universe, which did come into violent conflict with the picture previously drawn up and accepted by the Church. Nor was the Church deceived ; for the Pope soon put Copernicus' book on the banned list, Later on, Galileo was tortured for writing that the earth moved round the sun ; but had Galileo only had time to study " logic," he might have kept himself out of trouble.

Besides gaining scientific knowledge of the universe around us, of the sort of bodies that it contains and of their mutual relations, we also gain scientific knowledge of the internal constitution and motions of things ; and this is particularly important for explaining how things work, for controlling them, altering them, etc.

For example, we have gained considerable scientific knowledge of our own bodies, and how they work. Of fundamental importance was the discovery of the cell structure of organic substances, and of the laws of cellular growth through the division and multiplication of cells. Further investigation led to discoveries about the internal structure of cells themselves. Again, the discovery of nerve-cells (neurons), and the investigation of their structure and relationships, and of the way in which they transmit impulses, is of tremendous importance for the explanation of the behaviour of animals ; especially of such animals as ourselves, with a highly developed and complicated central nervous system.

The cells of which the body is composed exist just as surely as the body does. Their existence is very well verified. We see them through microscopes, can observe and modify their growth, can influence their behaviour experimentally and observe the results, etc. Though like all scientific knowledge, this knowledge, too, remains extremely incomplete.

It was the development of chemistry which gave rise to the distinction of chemical compounds and elements. On the basis of that distinction, quantitative research began on the ways in which elements combine together to form chemical compounds. It was established that that combination always takes place in fixed numerical ratios. Thus was engendered the atomic hypothesis, according to which all chemical substances consist of very small atoms, different sorts of atoms

corresponding to the different elements, and the atoms combining together in definite ways to form chemical molecules.

This was to start with no more than a working hypothesis. (To the nature and significance of working hypotheses I will return briefly later in this section.) Thus the question was agitated, did atoms really exist, or was their existence merely a convenient fiction or manner of speaking? Positivist philosophers in the latter half of the last century, such as Mach and Compte, were extremely scornful of anyone who was so credulous as to think that the atoms really existed. They explained that to talk of atoms was merely a convenient way of formulating the quantitative rules of chemical combination. As for such things as atoms existing, that was ridiculous metaphysics, and could never be capable of verification.

Nevertheless, the atomic hypothesis, originally introduced as a result of chemical discoveries, developed great explanatory power. For instance, it was possible to explain the nature of heat, and to account in an exact manner for many unexplained phenomena of heat, on the hypothesis that heat consisted in the movement of the atoms and molecules of which matter was composed. This led further to the explanation of the solid, liquid and gaseous states of matter. In the solid state, the individual atoms lie very close together, and their movements are not sufficient to counteract the forces that hold them together. If the atomic movements increase, the atoms break away, and the substance enters first into a liquid state, and then becomes a gas. Moreover, further quantitative investigations made it possible to specify fairly exactly what the size and weight of atoms must be, and the number of atoms contained in a given quantity of any substance. (There are $6 \cdot 10^{23}$ atoms in a gramme of hydrogen; the weight of each atom is $1 \cdot 6 \times 10^{-24}$ grammes, and its diameter 10^{-8} cm.)

If the results just mentioned were such as to create an increasing presumption that such things as atoms really existed, their existence has by now become definitely established as a result of the further development of atomic physics—verified experimentally and through the use of technique.

The first full verification of the atomic hypothesis came

through the investigation of radio-active substances. This meant that instead of merely postulating the existence of atoms as an explanatory hypothesis—a hypothesis to which all the more weight could be attached because of the wide field of phenomena it was able to explain—it became possible to study individual atomic processes, and the transformation of atoms of one element into those of another. Moreover, the striking experimental confirmation of the existence of atoms, revealed at the same time the divisibility of atoms, and that the atom was a structure composed of more elementary objects—the atomic nucleus and its accompanying electrons. It became possible to determine with great exactness the size and weight of atoms, to formulate the laws of atomic transformation, to indicate the atomic structure of the atoms of different elements, and to specify the size, charge and weight of atomic nuclei and of the electron. Moreover, all this confirmed the previous quantitative results secured by other methods previously on the basis of the atomic hypothesis.

More recently, the cloud-chamber technique invented by C. T. R. Wilson enables photographs to be taken of the paths traversed by individual atomic nuclei and by other components of atoms, set free by atomic transformations. This technique depends on making water vapour condense around the path of electrically charged particles inside the cloud-chamber ; and a photographic apparatus then records on a photographic plate the streaks formed by the condensed water vapour. By means of cloud-chamber technique, not only were electrons and protons identified, but also other types of " elementary particles," positrons and neutrons, whose existence had already been suggested as a hypothesis by certain theoretical developments of atomic physics. In this way the existence of atoms and their various sub-atomic components is established with fully as much certainty as the existence, for example, of distant stars ; that is to say, by photographic records.

Moreover, the techniques being developed by physics enable us, not merely to observe and photograph these sorts of objects, but to produce them and influence their motions and effects. Hence their existence must be regarded as very substantially verified.

It was just after I had drafted the above lines, that the

news was announced of the production of the atomic bomb ; namely, that a technique had been invented for utilising the process of the nuclear fission of uranium for definite ends—in the first place, for blowing up cities. This brilliant technical development will inevitably lead to other applications, for the purposes of peace. Naturally, it confirms beyond doubt the existence of the sub-atomic objects and processes, which are no longer put forward as a hypothesis, but are produced and used ; although very much still remains to be learned of their nature and laws. It has also brought forward in a startling and urgent way the philosophical truth, that science is knowledge of objective nature, which is equivalent to power over nature ; and that it behoves us to understand this, and to organise the use of that power for the progress and well-being of mankind.

It must be remarked in these examples how the development of scientific theory proceeds from hypothesis to knowledge. When a subject is under investigation, the explanation of the facts observed is usually in the first place advanced in the form of a working hypothesis. Such a hypothesis suggests further lines of investigation—further results which will be forthcoming if the hypothesis corresponds with the reality. By pressing forward such investigations, the working hypothesis is either shown to be erroneous ; in which case some alternative line of theoretical explanation has to be sought ; or else it is confirmed, and in the process of confirmation the hypothesis becomes knowledge. In the process of confirmation or verification, moreover, the hypothesis itself is generally modified, developed and corrected. And it is also necessary to premise that when we can claim to have scientific knowledge, such knowledge itself cannot be absolute, but is incomplete and provisional.

A very clear example of the confirmation of working hypothesis is sometimes given from the study of the planets. New planets have been discovered as a result of the observation of unexplained irregularities in the motions of known planets. Thus a hundred years ago, irregularities were observed in the motion of Uranus ; and to account for these it was suggested that there must be another planet whose orbit was outside that of Uranus. This was a working hypothesis. On the

basis of such hypothesis telescopes were directed upon the position where such an unknown planet was expected to be found, and the result was the discovery of the planet Neptune. The observation of Neptune confirmed the working hypothesis. The existence of Neptune became a matter of knowledge, not of hypothesis. Later on, study of the movement of Neptune revealed more unexplained irregularities, and the hypothesis was advanced that there was yet another planet outside Neptune. This again was observed in 1930, the new planet being named Pluto, its observed period, perihelion, etc., agreeing remarkably well with the predictions made by the working hypothesis.

In this example it seems to be abundantly clear that the working hypothesis is the hypothesis of the existence, objectively in external space, of an object having certain recognisable properties—namely, of a planet. The hypothesis is not just a system of scientific statements giving a rule for where points of light will be observed through telescopes ; but it is a statement to the effect that something exists externally, namely, a planet. When the hypothesis is verified, then, instead of conjecturing the existence of such a planet, we can say that we know that it exists.

The development of scientific knowledge can be likened to the charting of an unexplored, or only partly explored, territory. The territory exists objectively ; whether we have charted them or not, the various mountains and plains, rivers, bays, etc., exist. Suppose the explorers are charting a particular river. They have been up it for 100 miles, and so they can fill in the course of the river for 100 miles on their map. Past that point they are not yet sure ; but they think the river may rise in some mountains another 100 miles in the interior. So on their map they mark the rest of the conjectured course of the river by a dotted line. These explorers will have to be constantly altering their map. Parts of it will be full of dotted lines, other lines will be firmly drawn, but even with regards to some of these they must take care not to use indelible pencil, for they may have to alter them in certain respects.

It of course frequently happens in the development of science that hypotheses are put forward which are not borne out.

For instance, in the 17th and 18th centuries it was generally presumed that the movements of animals were governed by the motions of what were called " the animal spirits." The body was supposed to be full of little channels, along which flowed the animal spirits. This hypothesis was, for instance, taken as gospel by the late Mr. Tristram Shandy, when he wrote in the first chapter of his *Life and Opinions :* " You have all, I dare say, heard of the animal spirits. . . . Well, you may take my word, that nine parts in ten of a man's sense or his nonsense, his successes and miscarriages in this world, depend upon their motions and activity, and the different tracks and trains you put them into." This hypothesis was given up with the development of the cell theory of organic substances, and with the discovery of the nature and functions of nerve cells and of the central nervous system. The hypothesis of the animal spirits was superseded by knowledge of the transmission of impulses through nerve cells. At the same time, it is clear, on the one hand, that the animal spirits hypothesis was not, as we should say, entirely wrong, but it did contain a partial correspondence to the truth ; and on the other hand, that our present knowledge of the central nervous system is intermixed with what still remains a great deal of conjecture and hypothesis.

The principal mark of scientific genius is the ability to advance a bold and fruitful working hypothesis, combined with the technical ability to carry out the investigations and experiments indicated by that hypothesis. This ability was possessed, for example, in a most pre-eminent degree by Rutherford. It was Rutherford who advanced, as a working hypothesis to explain the phenomena of radio-activity, the theory that what was taking place in radio-activity was the transformation of elements, and that the atom was divisible. It was this hypothesis which determined the whole subsequent brilliant development of atomic physics ; and Rutherford's technical ability in devising delicate experiments played further a leading part in that development. In the course of these experiments, as has already been indicated, the hypothesis was fully confirmed, and our knowledge of atomic and sub-atomic processes was enlarged and extended in many ways.

But in the sphere of atomic physics, it must once again be stressed that our knowledge is general, abstract, incomplete, and in many respects provisional. The detailed analysis of physics at any stage must distinguish those principles which are established from those which are hypothetical—and the distinction is not always a rigid one. For example, in the "Bohr model" of the atom, the electrons were represented as "particles" revolving round the atomic nucleus, on the model of the solar system. This was a working hypothesis which proved very useful, but which seems not to be turning out to be literally true. The further investigation of sub-atomic processes has shown that electrons exhibit wave-like as well as particle-like effects; and also suggestions are made about the possibilities of the creation and annihilation of such "elementary particles" as electrons. Clearly big and important modifications and developments of sub-atomic theory are taking place and are going to take place. But this does not affect the indubitable objective existence of sub-atomic processes; any more than the fact that there are many obscurities about the way in which our central nervous system works, contradicts the objective existence of the central nervous system and the fact that it does control our behaviour.

In concluding this section, it is useful to add a note about the famous "Principle of Economy" or "Occam's Razor," which is supposed to be a guiding principle for the formulation of scientific theories, and to which, as we have seen, great importance is attached by exponents of "the logical analysis of science." This is the principle which states: "Entities are not to be multiplied beyond necessity."

Those philosophers who teach that scientific theory does not describe and explain the nature of the objective material world, but consists in the formulation of rules of the order in which events turn up in experience, always attach great importance to the Principle of Economy. The principle that "entities are not to be multiplied beyond necessity" means simply that we should formulate such rules in the simplest possible way. Thus Wittgenstein restated the principle in this form: "What is not necessary is meaningless." In formulating scientific rules we should use as few entity-words as possible, and if we introduce additional entity-words which